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ABNORMALITIES OF THE HEART BEAT: THEIR RECOGNITION AND EFFECT ON THE PULSE.

By JOSEPH COEN, M.B. (Sydney),
Sydney.

DISORDERS of the rhythm of the heart are not uncommon; their recognition, when they affect the pulse, which they not always do, is usually readily determined by palpation of the radial artery at the wrist and is expressed by alteration in rhythm or force or both. At times, however, it is difficult to determine by ordinary clinical methods the exact condition and to know by the behaviour of the pulse what the heart is doing. Under normal conditions the pulse is the result of the contraction of the ventricles; this is in turn due to the stimulus for contraction which arises in the sinus node and travels by way of the auricular muscle to the auriculo-ventricular node, thence through the bundle of His and its branches to the ventricles, which are excited to contract. Under certain circumstances, however, not every stimulus produces a contraction of the ventricle nor every contraction of the ventricle a corresponding pulsation at the wrist. Thus, in the irregularity of the pulse associated with the condition known as extra-systole a contraction of the ventricle occurs which fails to produce a pulse at the wrist; at other times the auricle contracts prematurely and although the stimulus is conveyed to the ventricle in the ordinary way, the resulting ventricular contraction is futile at the wrist. The mechanism of the production of abnormal heart beats presents many variations and an outline of the factors involved will be of assistance in the interpretation of the accompanying records which are from patients showing irregularities of the pulse.

The heart muscle possesses the properties of rhythmicity, conductivity, excitability and contractility. In every normal beat these functions are exercised; disturbance of any one of them may cause an abnormal beat.

Disturbances of Rhythm.

Moderately rapid and moderately slow heart beats without irregularity are usually due to changes in the rate of impulse formation in the sinus node. The average rate is seventy to eighty in normal adults.

In a given individual the pulse rate varies considerably, as for example, under the influence of emotion or exercise. Both the vagus and sympathetic nerves influence the heart rate; frequently they both seem to act together, stimulation of the one being associated with inhibition of the other. The rate of impulse formation in the sinus is normally subject to a continuous inhibition by way of the vagus nerves. If this be removed, as for example by the subcutaneous injection of 0·001 gramme (one-sixtieth of a grain) of atropine, the pulse usually accelerates to over one hundred per minute. A quickening of the rate also accompanies exercise, low blood pressure, fever and conditions in which the metabolism is raised, as in exophthalmic goître.

If the inhibition exercised by the vagus be increased, bradycardia results, for example, pressure on the vagus in the neck, stimulation of the vagus as occurs in acute asphyxia and meningitis, the action of drugs (digitalis) and conditions in which the metabolic rate is reduced. The bradycardia from jaundice and that which occurs in the convalescence from acute illness, are also held to be the result of increased vagal tone.

In both tachycardia and bradycardia of sinus origin the beat is regular and also the pulse. In sinus arrhythmia, although the stimulus arises in the sinus node and the wave of contraction spreads normally through the heart muscle, the beat is irregular. The most common type of this irregularity is associated with respiration and is common in young people, being called the "irregularity of youth." It is also not uncommon during the convalescence from acute illness and in association with the post-febrile type of bradycardia. Figure II illustrates the condition.

Disturbances of Conduction.

It will be recalled that the stimuli which cause the cardiac contractions, travel from the sinus node through the auricular muscle to the upper end of the His bundle, which divides into two branches supplying the right and left ventricles. Disturbances of conduction may give rise to (i) a retardation in the transmission of the stimulus, (ii) an occasional interruption or partial block and (iii) to a complete interruption or complete block. In general it may be said that stimulation of the vagus diminishes conductivity, whereas stimulation of the sympathetic improves it. The effect on the pulse is variable and depends on the regularity or otherwise of the block. Figure VIII is an example of what is known as two to one block in which the pulse was regular.

Ectopic Beats: Extra-systoles.

Cardiac contractions that arise at some point other than the sinus node, are known as ectopic beats. They may occur singly or in rapid succession; they may originate in the auricles or in the ventricles. Premature beats or extra-systoles are beats which occur prematurely and interrupt an otherwise normal rhythm. Two types of ectopic beats are to be distinguished.[1] They are called homogenetic and heterogenetic. In the former, when the impulse formation in the sinus node is inhibited, a new pacemaker appears, usually in some part of the *A-V* node or the His bundle, and they are so named because they are due to a dormant normal rhythm that is ordinarily masked by the predominant sinus rhythm. Heterogenetic beats are entirely abnormal and usually originate in some part of the heart muscle. The type most commonly met with is the ventricular extra-systole which causes an intermittent pulse. Examples of such premature beats are shown in the records illustrated. Paroxysmal tachycardia is the result of a succession of rapid and regular extra-systoles

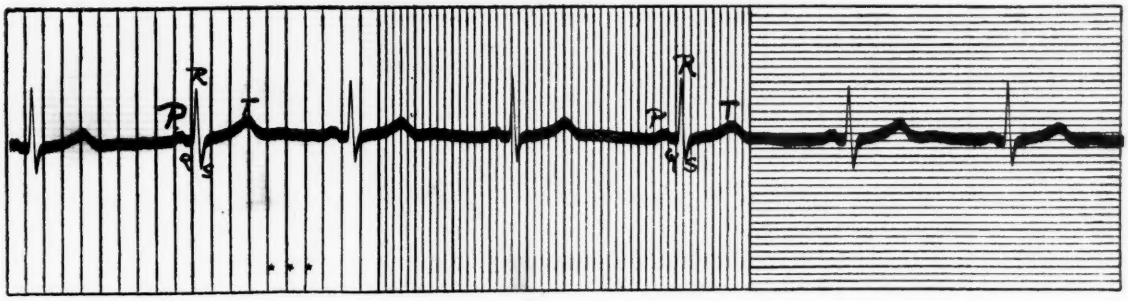


FIGURE I.
Normal Electro-cardiogram.

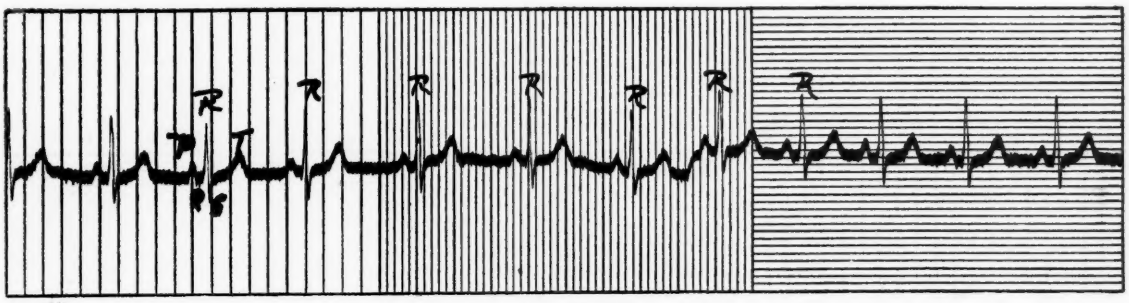


FIGURE II.
Sinus arrhythmia. From boy, aged thirteen years, who had rheumatic fever one year ago. All waves are normal; the irregularity is indicated by the varying distances between *R*. The pulse was irregular at the wrist.

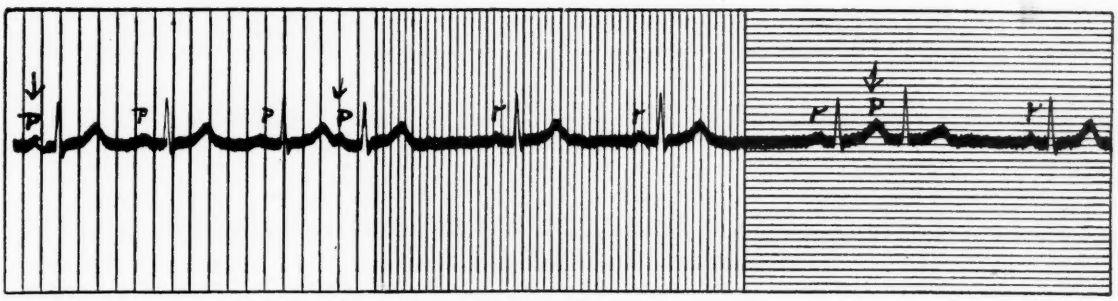


FIGURE III.
Premature auricular contraction; the auricle contracts prematurely in three cycles (marked by arrow); in the last premature beat *P* falls on the preceding *T*; the pulse at the wrist is intermittent, the reason being that there is no diastole during the cycle in which the premature beat occurs, and although the ventricle responds and contracts, no pulsation occurs at the wrist, as sufficient blood has not entered the ventricle to produce a pulse.

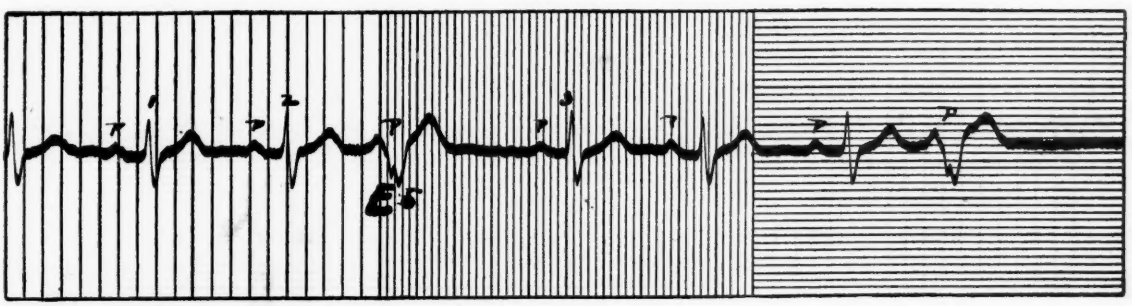


FIGURE IV.
Ventricular premature contraction; extra-systole. There are three normal cycles followed in each instance by an extra-systole, which by its form is known to arise in the left ven tricle. The pulse at the wrist was intermittent the extra-systole (marked *E.S.*) being futile.

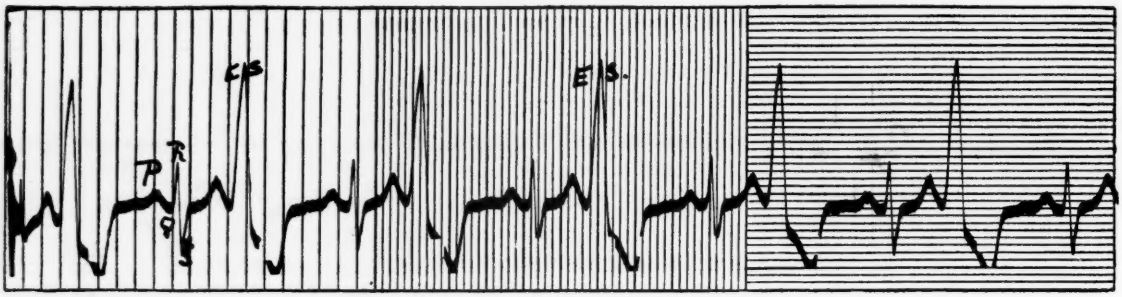


FIGURE V.

Ventricular extra-systoles arising in the right ventricle. An extra-systole succeeds each normal contraction. The pulse at the wrist was regular, the extra-systole being futile.

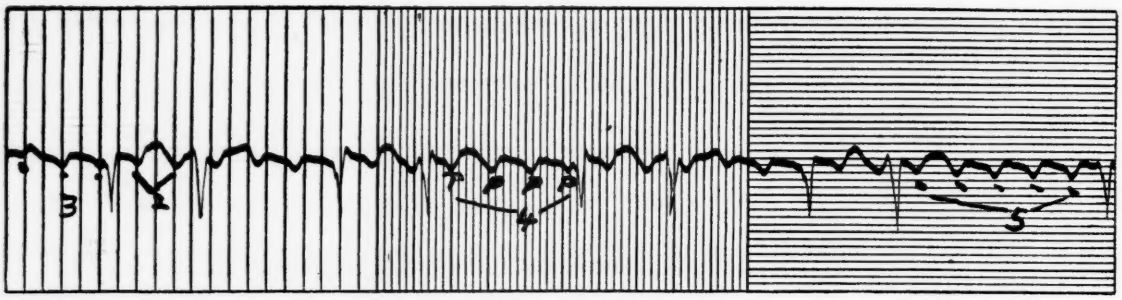


FIGURE VIA.

Auricular flutter. The typical feature is the continual up-and-down wavy movement of the base line at the rate in this instance of about 280 per minute. This wavy line is due to the auricular activity and has the ventricular waves superimposed on it. It is best seen in Lead II and Lead III. This record is from a patient at the commencement of an attack in which he noticed that "something had gone wrong with his heart"; it was taken two days afterwards. A two to one relation of auricular and ventricular waves is the usual thing in auricular flutter, but this depends on the functional condition of the *A-V* bundle and three to one or four to one or irregular ventricular responses are commonly found. This record illustrates a combination of five to one, four to one, three to one and two to one. The ventricular complexes are shown occurring after a varying number of *P* waves. The result is a completely irregular pulse, which the patient exhibited. The downward direction of *P* indicates that it has arisen outside the sinus node, while the form of *Q-R-S* indicates a supraventricular origin. The record is from Lead III; the auricular rate is 280, the ventricular 90 and irregular.

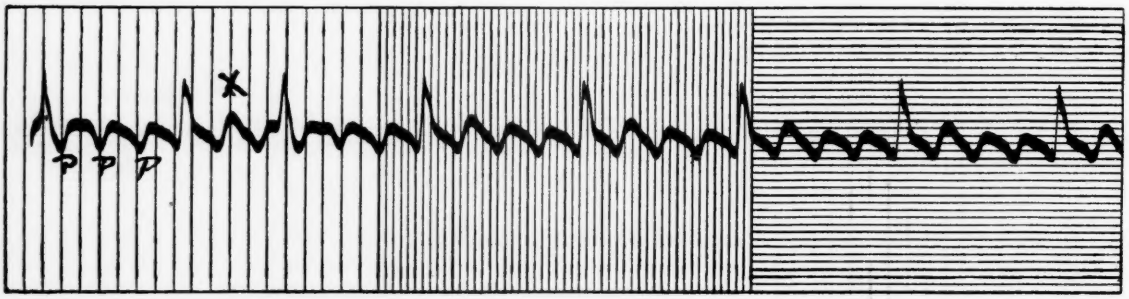


FIGURE VIB.

This is a record from the same patient two weeks later, after rest in bed. It will be seen that flutter is still present and yields a four to one block throughout, except in one cycle (marked *x*). The auricular rate is still 280 and regular, the ventricular rate is 74 and much more regular than in the previous record.

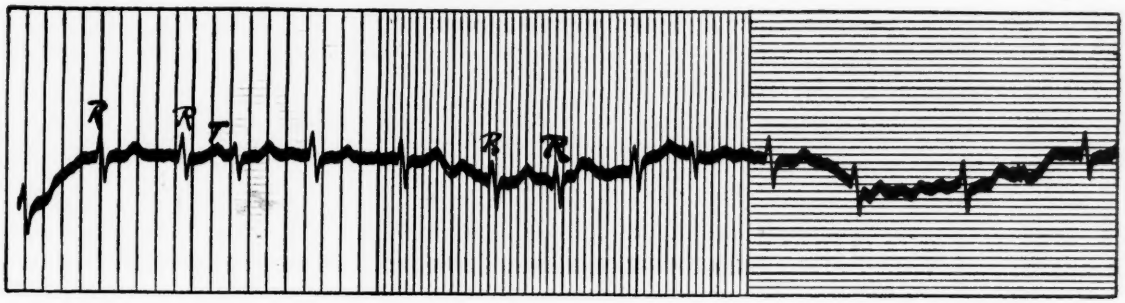


FIGURE VIIA.

Auricular fibrillation. The *P* wave is absent; the *Q-R-S* complexes are normal in form, but they occur with absolute irregularity. The ventricular rate in this case was 132; at the wrist it was 112. This patient had had no treatment.

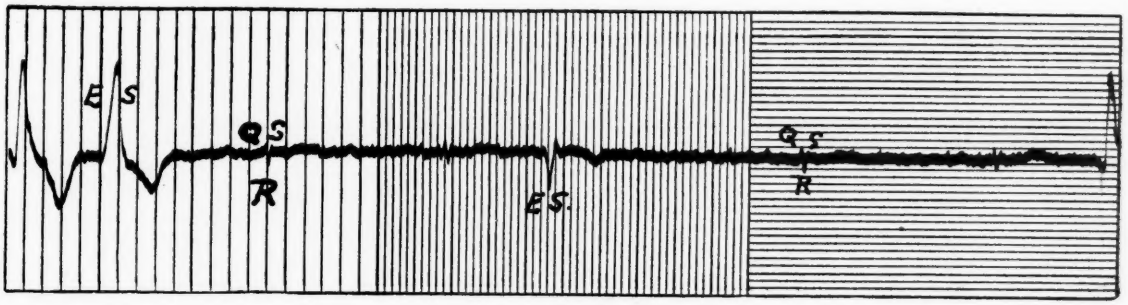


FIGURE VIIB.

Auricular fibrillation. This patient was under treatment with digitalis for some months—up to three mils (fifty minims) a day. Figure VIIc is a continuation of VIIb. Both show fibrillation of the auricles and frequent extra-systoles. Figure VIIb opens with two extra-systoles and others are seen throughout the records. The *Q-R-S* complex is of very low voltage and occurs irregularly. The fine wavy line indicates fibrillation of the auricles. The frequent extra-systoles and the long diastolic pauses are probably the effect of overdosage by digitalis. The rate at the apex in this patient was about 80, while at the wrist it was about 74 and was difficult to discern. The patient had fair efficiency and was able to go about in moderate comfort.

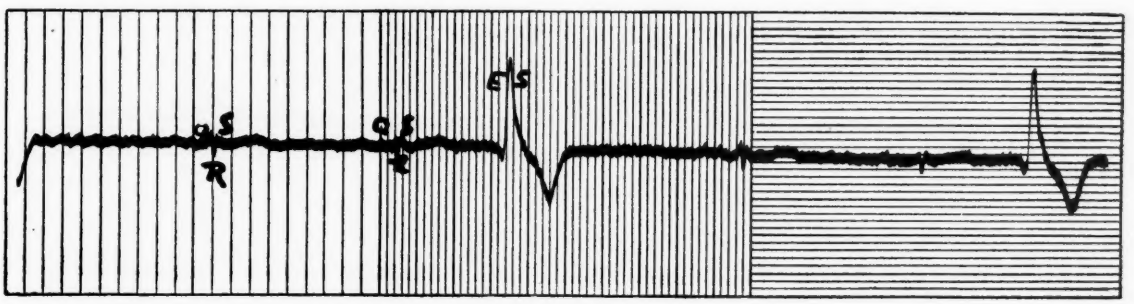


FIGURE VIIC.

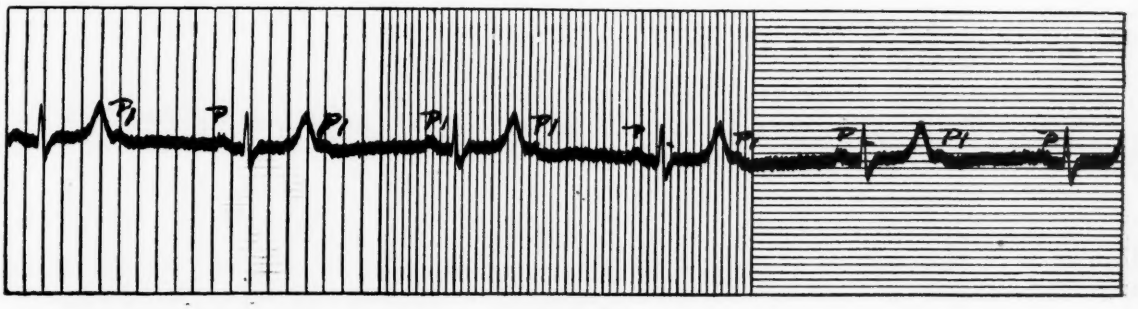


FIGURE VIII.

Heart block. Each alternate auricular impulse is blocked and produces no ventricular contraction. Each *P* wave is of sinus origin; the waves marked *P1* are blocked. The *Q-R-S* complex is normal in form throughout and falls regularly. The block in this instance was probably due to an organic lesion of the *A-V* node or bundle of His, as there is distinct evidence of arterio-sclerosis in all the palpable arteries. The pulse at the wrist was regular and of good volume and clinically there was nothing to indicate the condition.

arising in the auricle. The rate in this condition is one hundred and forty to two hundred; each auricular impulse is followed by a ventricular contraction and a corresponding pulse at the wrist.

In the condition known as auricular flutter the auricular rate is more rapid than in paroxysmal tachycardia, being as a rule between two and three hundred per minute. The auricular contractions are regular, but owing to their rapidity a partial block between the auricles and ventricles occurs. The most common is two to one block and in this case the ventricular rate is exactly one-half the auricular rate and is often perfectly regular. At times the degree of block varies and the result is an irregular pulse. Such a mechanism is illustrated in Figures VIA and VIB.

In auricular fibrillation the rate is more rapid still and there is a rapid and irregular series of incoordinated contractions of different parts of the auricular muscle. The large number of impulses passing over the auricular muscle bombards the upper end of the His bundle; the impulses that get through, do so irregularly and the ventricles show an absolute arrhythmia. This arrhythmia is impressed on the pulse which presents the characteristics of auricular fibrillation. Figures VIIA, VIIB and VIIC are examples of such cases.

Ventricular fibrillation when it occurs, usually does so as a terminal event and is important as a cause of sudden death. It is the probable cause of death occurring suddenly on the operating table during the early stages of chloroform anæsthesia; it is one cause of death in electrocution.[2] Experimental occlusion of the coronary arteries causes fibrillation in animals and it appears probable that the sudden deaths which occur in *angina pectoris* and in those suffering from coronary disease, are due to this arrhythmia. Sometimes patients with auricular fibrillation die suddenly and it is said that in these circumstances the rhythm extends from the auricle to the ventricle.

The part played by the function of excitability in producing abnormal heart beats is debatable. Some authorities say that increase of excitability is an important cause in the production of extra-systole. Lewis[1] says that a rise of excitability cannot be conceived to originate an extra-systole; it is more probable that they are conditioned by effective stimuli newly generated in the heart muscle. He points out that excitability may be found to be diminished in hearts which at the same time exhibit spontaneous extra-systoles. The part played by the cardiac nerves is important, but the exact cause is elusive.

Disturbance of the function of contractility is seen in the condition known as *pulsus alternans*. In it the ventricles beat with perfect regularity, but the pulse waves are alternately large and small. It is due to variations in the contractile power of the left ventricle and is usually of grave omen. It is best recognized in a sphygmographic tracing. The accompanying records, which illustrate graphically some of the abnormalities mentioned, are made with an electrocardiograph which is the electrical method of studying the mechanism of the heart beat. Every muscular contraction is associated with electrical changes which begin as a primary negative electrical potential that travels over the muscle. The electrical currents generated by the heart may be recorded by connecting a sensitive galvanometer to the extremities of the body. Three methods of leading off the current from the body are used and are called leads. Lead I is from the right arm to the left arm; Lead II from right arm and left leg; Lead III from left leg and left arm. Electrocardiograms from a normal heart contain a series of waves, called *P*, *Q*, *R*, *S* and *T* waves (Figure I). *P* is evidence of auricular activity and is normally upright in all leads. Since we know that normal auricular contractions are initiated in the region of the sinus node, it may be assumed that whenever *P* is upright in all leads, the auricular contractions arise in or near the sinus node. Alterations of *P*, such as inversion or absence, indicate that the contraction has arisen in some other part of the auricle than the sinus node. The *Q*, *R*, *S* and *T* waves are produced by the activities of the ventricles. Normal complexes are the result of impulses that enter the ventricles through the His bundle and spread through its branches in a normal manner. The form of this complex may be altered from several causes. Changes in the position of the heart, hypertrophy of one ventricle relative to the other; the impulse for contraction travelling by an unusual route or a contraction arising within the ventricles will all cause alterations in *Q*, *R*, *S* which are readily recognizable as departures from normal.

Changes in the *T* wave also occur and although there is some diversity of opinion as to their significance, a large number of observers attaches great clinical importance to them. Inversion of *T* in Lead I and Lead II is said to indicate a serious cardiac lesion.

As well as showing the different waves of contraction, the time relations of the various events in the cardiac cycle can be accurately determined. In the records the first set of vertical lines is spaced at an interval representing one-tenth of a second; the second set at an interval of one twenty-fifth of a second; the horizontal lines are spaced at intervals of one millimetre. The galvanometer in the instrument is standardized, so that ten millimetres of excursion of the string shadow will represent one millivolt of current in the circuit of the patient. The height of the *R* wave in the record is measured against the standard and variations in the voltage of *Q*, *R*, *S* estimated. Generally speaking small values for *R* mean a muscle below par, while large values mean a well nourished muscle (Pardee). The time taken in transmission from auricle to ventricle is estimated by measuring from the commencement of the *P* wave to that of *R*; normally it lies between 0·1 and 0·2 second.

References.

(1) Thomas Lewis "The Mechanism and Graphic Registration of the Heart Beat," 1920.
(2) Albion Walter Hewlett: "Pathological Physiology of Internal Diseases," 1924.

RADIUM TREATMENT IN AUSTRALIA.[1]

By ARTHUR BURROWS, M.D., M.R.C.P. (London), D.M.R.E. (Cambridge),
Commonwealth Department of Health.

IT is necessary in giving a lecture on radium treatment to state at the beginning some of the elementary facts concerning the physics of radium, so that those present who are not acquainted with the physical properties of radium, will be able to grasp the principles involved when treatment is described.

The Structure of the Atom.

It is now generally assumed that the atom consists of a positively charged core around which revolves a characteristic number of negative electrons. The number of electrons varies with the nature of the element which the atoms constitute.

The Break-Down of the Radium Atom.

Most elements are stable and their atoms are in a state of equilibrium so far as is known. In the case of such stable elements the atoms can be broken down only by means of a bombardment with electric ions. In the case of radium and other radio-active substances the atom is not stable and a certain definite proportion of the atoms is continually in a process of disintegration. This process of breaking down results in the formation of (i) rays and (ii) emanation and active deposit.

The Rays.

The rays consist of three kinds, α, β and γ.

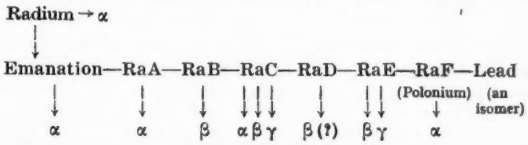
A rays are positively charged atoms of helium and constitute 90% of the ionizing power of the radium rays. It should perhaps be explained here that ionization is the process by which air and similar substances are rendered conductors of electricity. The α rays are easily stopped and absorbed by the container in which the radium is held or by four to six centimetres of air. They are not used much in medicine.

B rays are particles of negative electricity. The hardest of them move with a speed almost equal to that of light. The average distance traversed by them in air before absorption is 2·5 metres. They constitute 9% of ionization power of the radium rays.

Γ rays are waves in the ether and contain only 1% of the total ionizing power of the radium rays. It takes 115 metres of air to reduce the number by half and 13·75 centimetres (five and a half inches) of lead to stop them completely. γ rays are used mainly in modern techniques.

Emanation.

Radium emanation (radon) is a gas evolved as a result of the breaking down of the radium atom. It is an inert gas, but in its turn it breaks down, giving off an α ray with the formation thereafter of a series of metals called active deposit. The active deposit is radio-active. I give here a diagram showing the decay and transformation of radium.



The main source of radiation from the active deposit is radium C. It is also, as can readily be seen, the main source of radiation from radium itself. So it becomes clear on examination that the source of rays which are used in therapeutics, is identical in the cases of both radium and radium emanation. The only difference is that radium element itself has a very large number of atoms to draw upon during the process of its decay and takes just under 1,700 years to diminish to half strength, whereas emanation only takes 3·86 days to go through the same percentage change. Thus 100 milligrammes of radium bought by the government during the period of the early Roman Empire would now be rather less than 50 milligrammes, whereas a tube containing 100 millicuries of radium emanation made rather less than four days ago would now be of a strength of 50 millicuries and in another 3·85 days its strength would be 25 millicuries.

A millicurie is the unit for measuring radium emanation and it is defined as the quantity of emanation which is in equilibrium with a milligramme of radium element. In practice it takes about thirty days for a tube of radium emanation to lose its total strength.

Use of Screens or Filters.

In Australia we propose to limit the number of metal screens to be used or at least to express the screening power of the metal employed in terms of monel metal or platinum.

The screening effects of monel metal and platinum on β radiation may be roughly expressed as follows: Monel metal, 0·3 millimetre thick, cuts off between 80% and 90% of the β rays. Monel metal, 0·5 millimetre thick, cuts off over 90% of the β rays. Platinum, 0·5 millimetre thick, cuts off nearly 98% of the β rays. Platinum, one millimetre thick, cuts off all β rays.

Secondary Radiation.

When the rays traverse heavy metals an atomic disturbance is created which results in the emission particularly from the emergent surface of the metal of secondary rays. These rays are soft and irritating to the skin and other tissues. In consequence when radium apparatus is applied to the skin or mucous membranes, it is usual to interpose layers of paper, aluminium or India rubber or other light substances between the apparatus and the skin which act as "secondary filters" and so protect the superficial tissues from excessive reaction.

[1] Read at a meeting of the South Australian Branch of the British Medical Association on September 20, 1928, and at a meeting of the Victorian Branch of the British Medical Association on October 16, 1928.

Distance Radiation.

As with X rays, so with radium it is the practice at present in most cases when treating tumours from the surface of the body to place the source of radiation at a certain definite distance from the skin. The amount of radiation which falls on the skin varies according to the law of inverse squares when distance is used and with a little thought you will find that the greater the distance the apparatus is removed from the skin, the greater is the amount of radiation falling on the deep tissues compared with the amount falling on the skin. It also will be seen that the total quantity is diminished by using distance and this can be made up for only by increasing the intensity of the source of radiation or the time over which it is applied.

The Government hopes to set up a mass treatment apparatus in which distance radiation will be applied with a source of radium of almost four grammes of strength. This effort is largely experimental, but it will be very interesting to see what the results will be in a few years' time.

Chemistry.

The chemistry of radium is at present of very little importance in treatment. The insoluble sulphate of radium is used for making fixed pieces of apparatus such as needles and plates. Thus if an accident or other misadventure occurs, the radioactive substance will not be soluble in water and the possibility of loss of radium by that means will be avoided.

For the production of radium emanation the bromide and chloride are put in solutions in the special vacuum pumps that are erected for the purpose. It has been found by the Radium Belge that the carbonate is more stable for the purpose of transport than the bromide. Consequently radium which is to be used for the extraction of emanation, is now being sent in the form of the carbonate which salt, of course, is readily soluble in dilute acids.

The Action of Radium on Normal Tissues.

It must be understood that the following remarks are of a very general nature and may need some qualification if particular cases are considered.

Radium produces its maximum effect on actively growing tissues and then its action is most intense on the individual cells during the process of division.

The more primitive the type of cell, the greater is the action of the radium rays upon it. Thus the action of radium is very marked on the primitive seminal cells of the testicle, on the ovules, lymphoid tissues, the primitive blood corpuscles forming cells of the bone marrow and probably gastric and intestinal mucosa.

The more highly developed the tissues, the less pronounced or it may almost be said specific is the action of the γ rays. Thus very large doses are necessary to produce well-marked action on sebaceous and sweat glands, bone and cartilage, resting mammary glands, normal thyreoid glands, stratified epithelium, the kidneys and muscle fibres.

Hence, if we apply these general principles to cancer we find (i) that the less differentiated types respond, so far as the primary growth is concerned, most readily to radium; for example, small round-celled sarcoma, basal-celled carcinoma, squamous-celled carcinoma of the cervix; (ii) the more differentiated the tumour, the less the action of the rays; for example, myxo- and chondro-sarcomata, adeno-carcinoma of the cervix (rare) and the body of the uterus.

The Radium Reaction.

Time does not permit me to go fully into the question of radium reaction, but it will be as well to mention the visible phenomena of the skin reaction in order that you may get some idea of the duration of the radium reaction. With unscreened radium the reaction occurs sooner, with screened later, due allowance having been made for the quantity. The undermentioned times are therefore somewhat delayed in the case of screened treatments.

The reaction is as follows: In seven to fourteen days, erythema; in fourteen to twenty-one days, swelling and vesication; in twenty-one to twenty-eight days, scab formation; from twenty-eight days onwards, healing and the dropping off of the scab. Both sepsis and overdose prolong the reaction.

The Australian Radium.

The radium which has been bought by the Commonwealth Government, has been mounted in the form of plates, tubes, needles, eye spatulas and a quantity reserved for production of emanation and for mass treatment.

Plates.

Only a small number of plates has been prepared. Their use is steadily diminishing, but they still have a limited application in the treatment of some of the superficial skin lesions. The plates are faced with a very thin layer of monel metal, but their dosage is exactly the same as that for the old varnished plates. As has been mentioned the plates are used only for very superficial lesions, because the method of distribution of radium over the surface of the plate tends to produce overdose beneath the centre of the plate deeper in the tissues.

Tubes.

In radium work it is the practice to refer to those tubes containing radium which are of greater strength, and for which the actual size is of no great importance, as "tubes."

Australian radium has been used to make up a certain number of tubes of strengths of fifty, twenty-five, ten and five milligrammes. Nowadays the strong tubes are employed less than they used to be. These tubes for the most part have a screening effect of one millimetre of platinum, are made of gold-platinum alloy, because it is cheaper than platinum, and the increased dimensions resulting from the use of this alloy are of no importance.

Needles.

Needles are very small, thin tubes with fairly sharp points. The Commonwealth radium has been mounted in two kinds of needles: (i) Platinum needles (the vast majority), (ii) monel metal.

Platinum needles are made of platinum and their walls are 0·5 millimetre thick. Per unit of length they are of three strengths: (i) one milligramme per linear centimetre, (ii) two milligrammes per linear centimetre, (iii) three milligrammes per linear centimetre, and may be described as unit, double and triple strength. The needle is constructed as is shown in the accompanying diagram (Figure I).

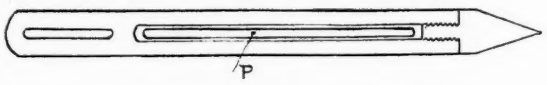


FIGURE I.
Showing construction of platinum needle. *P* = platinum cell containing radium.

It will be seen from the diagram that the total length and the active length of the needle are not the same thing. When speaking of the length of a needle it is best to refer always to the active or cell length.

The needles are of lengths varying from five millimetres up to fifty millimetres. The total strength of each needle is thus obtained by multiplying the active length by the unit strength. The unit strength of each needle can be readily recognized owing to the fact that the points have been made of a different shape for the three strengths.

The eyelet hole of the cell is slotted and not just a round hole which circumstance is of great convenience in the introduction and withdrawal of needles.

The wall thickness of monel metal needles is 0·3 millimetre and 0·5 millimetre. Only a limited number of these has been produced.

Eye Spatulas.

These are convenient, small, special applicators for application in diseases of the eye-lid, for example, spring catarrh.

Measurement of Dosage.

As is customary in the English speaking countries, we propose at the present time to measure our doses in milligramme-hours. The mere statement of the milligramme-hours of treatment does not give the whole of the facts which are necessary to understand what application of radium has been made. It is necessary to state also: (i) The total quantity of radium used, (ii) the number of sources used, (iii) the duration of the application, (iv) metal screen employed. For superficial applications (i) the area of the source and the arrangement of the tubes, (ii) the distance and (iii) the screen employed must be stated.

The French and Belgian and some other peoples employ millicuries destroyed as the unit of measurement. This unit has certain advantages which I do not propose to enter into at present, but it is possible that this system of measurement may become universal and it is advisable that the radio-therapeutist should make himself familiar with it, not only with a view to this future possibility, but also to render himself capable of reading intelligently French literature on radium treatment which at the present time is probably the best source of information on radium matters.

In using milligramme-hours difficulties are experienced in expressing dosage of radium emanation. This difficulty is readily got over by consulting tables which will be published by the Commonwealth in due course.

RADIUM IN TREATMENT.

As it is not possible to deal with the whole of radium treatment in this lecture, three special conditions have been selected for description and they are the diseases with which the radio-therapeutist will most often be brought into contact.

Carcinoma of the Skin and Rodent Ulcer.

Small Superficial Rodent Ulcers.

Superficial rodent ulcers, when very small, may be effectively treated by unscreened radium plates. A dose of a duration of one and a half hours, using a plate of a strength of five milligrammes to the square centimetre, will usually be sufficient.

Use of Needles.

In this treatment reference is made to needles of unit strength. In the case of monel metal needles which are buried in tumours, doses of twenty-four to forty-eight hours or more may be given. In the case of platinum three to ten days are required. Needles are buried in cancer of the skin as a rule when the thick edge or base of the lesion is fifteen millimetres or more in a cross section. Platinum needles should always be used for deeply indurated lesions.

The Use of Distance Radiation.

For a small lesion a distance of five millimetres may be used. The apparatus employed must be slightly larger than the lesion and a dose of one to two milligrammes per square centimetre of the area, screened by 0·5 to 1·0 millimetre of platinum, employed. In order not to produce overdose at the centre of the lesion, but rather to produce the maximum possible effect at the edges, the radium tubes are arranged on the applicator in the method shown in the diagram (Figure II) or such other modification as the shape and dimensions of the growth demand.

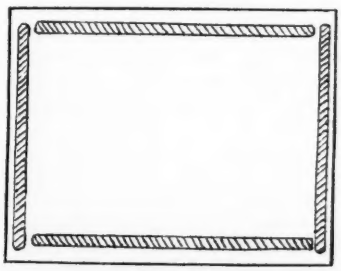


FIGURE II.
Showing arrangement of radium tubes on the applicator.

The duration of application for rodent ulcers is from one to four days and from seven to ten days for squamous-celled carcinoma. The reaction is a severe one, but passes off in due course. If the lesion is bigger, greater distance and different quantities of radium are employed.

The Treatment of Glands.

The treatment of glands is similar to that described under carcinoma of the tongue.

The results of radium treatment of carcinoma of the skin are very satisfactory and in my own figures which involved work for the most part done with the older and less satisfactory techniques, I obtained 70% of cures in all rodent ulcers and in the case of epithelioma over a five-year period 50% of apparent cures.

Carcinoma of the Tongue.

Fortunately in carcinoma of the tongue there is only one technique to describe and that is the one of Professor Regaud, of Paris. It is particularly in this condition and in carcinoma of the skin that the method of treatment by small doses of radiation given over a long period has produced such great improvements in the results obtained.

The Primary Growth.

The treatment of the primary growth is the most satisfactory part of the treatment of carcinoma of the tongue. The glands present a much more difficult problem.

For the tongue needles of unit strength are employed, screened by 0·5 millimetre of platinum.

Without going into much detail in respect of treatment it is probably simplest to say that the needles are buried one to two centimetres apart. They are introduced in a parallel manner and not allowed to cross one another in the tumour.

A diagram of the growth should always be made before treatment is started so that the operator knows exactly what he is going to do and how many needles he is going to introduce. An endeavour should always be made to clear up the lesion in one treatment. After one exposure to radium the growth becomes less radio-sensitive. The needles should always be stitched in position to prevent them from coming out. The time of exposure is from four to ten days.

Secondary Growths.

Regaud is of opinion that on the whole the treatment of glands of the neck by burying radium needles is not very successful and he now always treats them by applications given from the surface. A mould of the neck is made up of a substance called Columbia paste. This consists of (i) paraffin (melting at 62° C.) 100 parts, (ii) beeswax 100 parts, (iii) sawdust 20 parts. Packs of wood or other material may be used for the same purpose, although it is obvious that with these pieces of apparatus apposition is not so accurate as when moulds are used.

The radium tubes are fixed on the outer surface of the mould and are thus retained at a distance of three to four centimetres from the skin. The strength employed is one to two milligrammes per square centimetre of the area and the time of application twelve hours daily for fourteen days. It is found that the patient will not tolerate the mould for longer unbroken periods.

In respect to the treatment of glands Regaud states that in certain lesions of the anterior part of the tongue the gland area need not be treated at all if no glands are palpable. For other lesions of the tongue and in most cases in which small glands are present, treatment may be given by radium alone by the above method. If the glands are rather larger, they should be excised surgically and radium treatment applied afterwards. If the glands are very large, as much as possible should be removed surgically and the radium applied afterwards.

Regaud gives the following results. In 48% of cases the primary growth disappeared. In 24% of the cases the patient was completely well a year or more after treatment. These figures, I think, are not his most recent ones which I understand are better still.

Carcinoma of the Cervix of the Uterus.

Heyman's Technique.

An intracervical tube of thirty to forty milligrammes is inserted and a flat vaginal applicator, made up of tubes to a total strength of seventy milligrammes, screened by four millimetres of lead and rubber, is packed against the cervix.

The first dose is given for twenty-two hours. A week later the second of twenty-two hours is given and a third similar dose applied still another three weeks later.

Regaud's Technique.

Three to four tubes containing a total of twenty to twenty-seven milligrammes of radium are introduced into the cervical canal and the cavity of the uterus. By means of a special spring applicator two radium tubes of a strength of 10 to 12·5 milligrammes (total 22 to 25 milligrammes) are retained in the lateral fornices at a distance of approximately 0·5 centimetre from the mucous membrane and screened by 0·5 to 1·0 millimetre of platinum. The average time of application is four to eight days.

Donaldson's Technique.

Donaldson employs eight needles, each six centimetres long, containing a total of twenty-four milligrammes of radium (three milligrammes each) and twelve needles rather shorter, each containing two milligrammes of radium. The total dose is forty-eight milligrammes of radium. The screen employed is platinum 0·5 millimetre and the time of application six days. The longer needles are introduced into the broad ligaments, while the smaller ones are made to encircle the cervix. In this case the needles are introduced directly into the tissues.

Other methods have been employed, but at present it will do for these three techniques to stand for examples of different types.

Results.

The following results are given.

Heyman reports that for a five-year period 20% to 40% of all patients are well and 58% of patients with operable growths are well.

Regaud reports that for a similar period 15% to 20% of all patients are well and 40% to 60% of those with operable growths.

Donaldson's figures are more recent and it is difficult at present to compare them with other people's.

My own experience is similar, but it is interesting to see that in the case of carcinoma of the cervix the long time technique is not definitely of such great advantage and it is possible that we may have to modify our methods to obtain still further improvement in results.

Relative Sensitivity of Tumours.

I give here a brief list of the most important types of cancer arranged according to their sensitiveness to radium treatment.

Those favourable to radium treatment are carcinoma of the cervix of the uterus, carcinoma of the skin, carcinoma of the tongue, endothelioma, round-celled sarcoma (immediate), spindle-celled sarcoma (remote), carcinoma of the thyreoid, sarcoma of the naso-pharynx and probably *carcinoma simplex.*

Those more or less unfavourable to radium treatment are carcinoma of the œsophagus, carcinoma of the rectum, carcinoma of the liver, melanotic sarcoma, myxo-sarcoma and chondro-sarcoma.

Most of the other growths not named are intermediate in respect to their responsiveness to radium treatment between these two groups. In some cases it is not really possible to place the tumour in any of these groups and it is clear that poor results may be obtained because of the difficulty of access to the growth and our present inability to give the adequate dosage. There is a considerable field open to the surgeon to develope the technique of the surgery of access to growths.

Certain factors of a general nature have an adverse effect in respect to responsiveness of growths to radium treatment. Large size, poor blood supply, ill-nourished surrounding tissues, previous radiological treatment and the involvement of bone and cartilage by the growth render the prognosis of radium treatment more difficult when any or all of these factors are noticed.

RADIUM EMANATION.

Time does not permit of a full description of the use of radium emanation, but it has been mentioned that radium C is the main source of radiation in both radium and radium emanation. Thus, when allowance is made for its rapid decay, emanation can be used in precisely the same way as radium. In addition to this special techniques have been devised which develope the use as far as possible of the special conditions and advantages of emanation. These are as follow.

1. The use of unscreened glass tubes, sometimes called seeds. This method is gradually becoming obsolete.

2. More recently Muir's technique in which the small emanation tubes contained in minute platinum screens 0·3 millimetre thick are employed, has given very promising results in many cases.

3. In addition to this still more recently very small gold emanation containing tubes have been employed, the wall of the gold tubes being 0·3 millimetre thick.

These emanation needles are very small and it is not necessary to withdraw them from the tumour when such a process is difficult or dangerous.

ANOMALIES AND OBSTRUCTIONS OF THE URETERS.[1]

By FREDERICK CLARK, M.B., B.S., F.C.S.A.,
Honorary Assistant Surgeon, Perth Hospital; Honorary Assistant Surgeon, Children's Hospital, Perth.

ANOMALIES OF THE URETERS.

A BRIEF description of the development of the ureters will assist considerably in the understanding of the various ureteral anomalies about to be described.

The ureter first appears in the fourth week of fœtal life as a diverticulum from the hind portion of the Wolffian duct close to the spot at which the duct enters the cloaca.

The "uro-rectal" septum, developing at the same time, divides the cloaca into two parts, the future bladder and urethra in front and the rectum behind.

The lower ends of the Wolffian ducts expand more and more until they come to form two large cone-shaped cavities, quite indistinguishable from the cavity of the cloaca which they enter. The lower expanded ends of the ducts thus form part of the trigone of the bladder. That portion of the Wolffian duct from which the ureteral bud arose, is now part of the bladder, so that the ureteral orifice has come to its final position in relation to the trigone.

As the lower end of the Wolffian duct is now fixed and incorporated as part of the bladder, the duct in its further descent forms a loop passing downwards internal to the ureter and more and more of its walls is taken up to assist in the formation successively of the urethra and the vestibule of the vagina. Its downward progress eventually ceasing, it remains as Gaertner's duct in the female and the *vas deferens* in the male.

Any structures attached to the Wolffian duct will remain in the same relative position during its descent and so in the case of an additional ureter, the further the bud from the lower end of the duct in the beginning, the longer will it have to wait before the part of the duct to which it is attached becomes expanded to form portion of the urinary tract.

[1] Read at a meeting of the Western Australian Branch of the British Medical Association on July 18, 1928.

The ureteral bud may originally have been placed so high on the Wolffian duct that the development of the bladder and urethra is complete before the descent of the duct has been sufficiently advanced to allow the ureter to terminate in the urinary tract itself; in which case it may find a termination in the female in the vestibule of the vagina or in Gaertner's duct and in the male in the seminal vesicle, the ejaculatory duct or the prostatic utricle.

Twin ureters arise as separate buds from the Wolffian duct usually being close together and consequently opening finally into the bladder within a short distance of one another. In rare instances the buds are widely separated on the duct and while one ureter ends in the normal position in the bladder the other may reach any of the positions already mentioned.

One thing, however, is constant in all cases of double ureter. The higher kidney pelvis is invariably connected with the lower ureteral orifice, a fact of the utmost importance in the treatment of pathological conditions arising in such a urinary tract.

As the ureteral bud increases in length and grows dorsalwards and forwards along the posterior abdominal wall, its distal end becomes expanded giving rise to the renal pelvis. The primitive pelvis elongates and divides to form the rudiments of the major calyces; these in turn divide to form the minor calyces and still further division gives rise to the collecting tubules of the kidney.

The secretory tubules are developed from the metanephros which is moulded over the growing end of the ureteral bud. The tubules of the metanephros become specialized to form the glomeruli, convoluted tubules, loop of Henle and junctional tubules which last establish communication with the collecting tubules and so the kidney is formed.

If the division of the ureteral bud occurs early, one finds as a result a reduplication of the pelvis and sometimes of portion of the ureter itself.

This early division of the ureteral bud is sometimes accompanied by a division of the metanephros, giving rise ultimately to two completely separate kidneys, each with its separate pelvis or to a kidney the surface of which shows a depression running round its transverse circumference, marking the fusion of the portions of kidney substance which empty into separate pelves.

This reduplication of the pelvis and portion of the ureter is not to be confused with the true double ureter which arises as already mentioned from separate buds from the Wolffian duct.

Case Histories.

Ectopic Ureter.

R.D., a male, *ætatis* nineteen years, was first seen on April 24, 1928. He complained that for some years he had suffered from an intermittent discharge from the urethra. The discharge was clear and watery and on one occasion six months ago was bloodstained. There had never been an acute onset, the discharge had never been yellow and he had never had gonorrhœa, but had been told several times such was his trouble. He had no discharge when seen. He was seen again on April 27, 1928.

The prostate was massaged and a smear taken. Urethroscopy was performed. Nothing abnormal was seen throughout the urethra. Microscopical examination revealed no pus cells or gonococci in the smear.

He was seen again on May 3, 1928. Cystoscopy was performed. The bladder capacity was normal. The mucous membrane was normal. The ureteral orifices were normal, but the right orifice was very small. A function test was carried out. Indigo-carmine, two cubic centimetres, was given intravenously and appeared at both orifices in three and a half minutes. Both ureters admitted number 6 catheters with ease. In regard to the pelvic capacity, that of the right pelvis was 4·5 cubic centimetres, of the left six cubic centimetres. The cystoscope was withdrawn and a urethroscope passed into the posterior portion of the urethra.

A collection of blue fluid was seen in the urethra. Thinking this was dye-coloured urine leaking from the bladder, I swabbed out the urethra and next saw a distinct spurt of dye from the posterior wall. I repeated the swabbing several times and each time saw the dye appear.

I am of the opinion that this was a case of double ureter on the right side, one ureter being ectopic in the posterior portion of the urethra. I advised exploration of the right kidney, but unfortunately have not seen the patient since. Ectopic ureter in the male can only very rarely give rise to symptoms, as the ureteral orifice lies above the level of the external sphincter and so discharge cannot easily escape along the urethra.

A case of ectopic ureter opening into the urethra of a female child, aged six years, was recorded by R. C. Begg in *The British Journal of Surgery*, October, 1927, along with a list of the reported cases.(1)

Another case of ectopic ureter opening into the urethra of a female, aged fourteen years, was recorded by Roberto Alessandri in *Surgery, Gynecology and Obstetrics*, July, 1928.(2)

Double Ureter.

A female patient of Dr. F. Gill complained of constant dull pain in the left side of the back. Occasionally she had severe paroxysms of pain followed by vomiting. The pain extended down to the left groin on one occasion only.

Cystoscopy was carried out. The bladder capacity was normal, the mucous membrane was normal. Two ureteral orifices were present on the left side, the lower orifice being slightly inflamed. An indigo-carmine function test was carried out and a normal result was obtained on both sides. Catheters passed up both left orifices easily. A pyelo-ureterogram was taken (see Figure I). It reveals small pelves, completely separated, with double ureter.

Unfortunately this plate does not show the lower ends of the ureters, but the upper pelvis was connected with the lower orifice and *vice versa*.

Reduplication of the Pelvis.

A female, *ætatis* fifty-two years, complained of frequent attacks of pain of a bursting character in the left loin for the past two years during which time she had lost a considerable amount of weight. Relief from the pain had always been followed by frequency of micturition.

Cystoscopy was carried out. The bladder capacity was normal. Mild chronic cystitis was present. The right orifice was normal, the left slightly engorged. Specimens were taken from both sides after catheterization. That from the right side was sterile. That from the left contained pus cells and motile organisms. An indigo-carmine function test was carried out. The time for the right side was four minutes, for the left side it was seven and a half

ILLUSTRATIONS TO THE ARTICLE BY DR. FREDERICK CLARK.

FIGURE I.
Illustrating Case of Double Ureter.

FIGURE II.
Illustrating Case of Partial Reduplication of Pelvis.

FIGURE III.
Illustrating Case of Congenital Dilatation of Ureters.

ILLUSTRATIONS TO THE ARTICLE BY DR. FREDERICK CLARK.

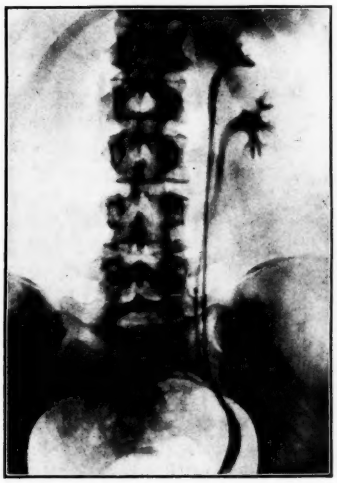


FIGURE I.
Illustrating Case of Double Ureter.

FIGURE II.
Illustrating Case of Partial Reduplication of Pelvis.

FIGURE III.
Illustrating Case of Congenital Dilatation of Ureters.

minutes. The left pelvic capacity was twenty-four cubic centimetres. The pyelogram (Figure II) shows partial reduplication of the pelvis and obstruction at the ureteropelvic junction, causing early hydronephrosis, more pronounced in the lower half of the pelvis.

Operation was performed. The condition of affairs shown by the pyelogram was found, the obstruction being due to a large aberrant vein crossing the ureter just below the pelvis.

CONGENITAL DILATATION OF THE URETER.

Congenital dilatations of the ureter may be: (i) partial, in which case part of the ureter from the pelvis downward is dilated, leaving the lower ureter and the orifice normal, (ii) incomplete, showing dilatation of the whole length of the ureter, but having a normal orifice, (iii) complete, including the whole of the ureter and its orifice.[3] These dilatations are almost always bilateral and of themselves give rise to practically no trouble and are not acccompanied by any pronounced diminution in the function of the kidneys.

In the event of a urinary infection occurring in such a case it is extremely difficult to clear up and in one of my patients caused definite interference with the renal function on both sides.

It is interesting to speculate on the probable cause of these congenital dilatations. At the end of the second month of fœtal life the ureteral bud growing cranially and dorsally from the Wolffian duct, has narrowed down to a uniform calibre, but is absolutely without musculature. Early in the third month muscle fibres appear, at first near the bladder and gradually they extend upwards, until at the middle of the fourth month they are present at the level of the renal pelvis. The ureter of the fœtus of four or five months has been found to be of very large calibre compared with the size of the kidney and the rest of the abdominal organs. One can readily suppose that, granted the musculature of the organ developes deficiently, the ureter may, instead of narrowing in the normal way, develope concurrently with the rest of the body and remain in adult life as relatively voluminous in calibre as it is in early fœtal life. Thus the adult ureter would be to all intents and purposes a mere tube along which the flow of urine would be controlled chiefly by posture without the aid of the normal muscular activity.

This is borne out by my own two patients whom I present. In neither was a "spurt" of urine seen from the orifices and one, after dilatation, stated that immediately he rose from the recumbent to the erect posture, he had an urgent desire to pass urine, due no doubt to the sudden emptying of both large ureters into the bladder.

As I have already stated, these conditions rarely give rise to symptoms unless infection occurs. In such an instance I believe the best treatment to be dilatation of the ureteral orifices and ureteral and pelvic lavage accompanied, of course, by the usual medication by the mouth.

It has been suggested that the congenitally dilated ureter might be divided and its proximal end reimplanted into the bladder through an oblique opening made in the bladder wall. This I believe to be wrong, as it overlooks the fact that such ureters are deficient in muscular power and consequently any sphincteric action exerted by the bladder muscle itself or more probably any cicatricial contraction at the site of implantation would still further impede the flow of urine from an already paretic ureter.

Case Histories.

A male patient, *ætatis* thirty-four years, complained that at frequent intervals for the past four months he had suffered from attacks of pain in both loins, headache, shivering and frequency of micturition. The attack was worst always on the second or third day. When he passed a large quantity of urine, usually on the fourth day, he felt better and could get about at the end of a week. He was first seen on the sixth day from the commencement of the attack.

At the time of examination he was very tender on pressure in both loins and along the course of both ureters. Otherwise nothing abnormal was found. Examination of the urine revealed large numbers of pus cells and organisms. Cystoscopy was performed ten days later. The bladder capacity was normal. There was mild cystitis, most pronounced in the trigone. The ureteral orifices were exceedingly small, almost pin-point. An indigo-carmine function test was carried out. The dye appeared from both orifices in eleven minutes, a decided delay. Catheters were passed with difficulty into both ureters. Specimens were taken from both sides and in both *Bacillus coli* grew on culture. The ureters were injected with sodium iodide, 15%, 110 cubic centimetres into the right ureter and 135 cubic centimetres into the left before any pain point was reached. A pyelo-ureterogram was made. This revealed definite dilatation and irregularity of both ureters which were obviously not completely filled. The dilatation of the ureters was out of all proportion to that of the pelvis on either side.

Repeated dilatations of the ureteral orifices, once very widely through a suprapubic opening, and lavage finally cleared up the condition and when last examined the urine was sterile and the renal functions were down to eight minutes on both sides.

With the absence of any history of urinary trouble earlier than four months before, I believe that the dilatation of the ureters in this case must be regarded as congenital.

A male patient, *ætatis* thirty-two years, complained of passing blood with the urine at intervals for the past four weeks. There had been absolutely no pain or other symptom of any kind.

Physical examination revealed nothing abnormal. Cystoscopy was performed. The bladder capacity was normal, the mucous membrane was normal. The ureteral orifices on both sides were very small. An indigo-carmine renal function test was performed. The dye appeared at both orifices in six minutes. The ureters were catheterized with difficulty. A pyelo-ureterogram was made (see Figure III). Sodium iodide, 15%, was injected into each ureter, 140 cubic centimetres into the right side, 165 cubic centimetres into the left. No definite pain point was reached on either side.

The pyelogram shows enormous dilatation of both ureters with a relatively small dilatation of the pelvis. Previously X ray examination of the urinary tract had failed to reveal any stone and nothing was found to account for the hæmaturia.

This patient had never had any previous urinary trouble and the condition in this case also must be regarded as a congenital dilatation of the ureters. The patient has been perfectly well since the examination and has had no return of the hæmaturia.

Ureterocele.

By the term ureterocele one implies a cystic dilatation of the lower end of the ureter. This condition is in no way comparable to prolapse of the ureter.

The latter condition, seen sometimes after the expulsion of a calculus from the ureter, consists of the extrusion of the ureteral mucosa or of all the coats of the ureter through the ureteral orifice. Thus the bulging mass is covered on its vesical aspect by ureteral mucous membrane.

In ureterocele, on the other hand, the dilated lower end of the ureter is clothed on its vesical aspect by vesical mucous membrane.[4]

The mode of production is uncertain and numerous theories have been advanced. The most reasonable of these attributes the condition to a dilatation of that portion of the ureter which lies distal to the vesical musculature, and is protected only by its own muscle coats. This may follow a stenosis, congenital or acquired, or may be caused by an intraluminal obstruction at the orifice itself.

The size varies considerably from a small ballooning to a large sausage-shaped swelling which in some cases in females has protruded at the urethral orifice.

I have seen one case of ureterocele during the last twelve months.

The patient was a man, thirty-one years old, from whom I was obliged to remove the left kidney for a large solitary cyst.

The right renal function was normal, but there was a ureterocele of the right ureter about the size of a large marble. The orifice was stenosed and impossible to catheterize. I punctured the swelling with the diathermy electrode and coagulated the redundant walls. Cystoscopy one month later revealed the orifice as large, but of normal shape without any sign of contraction and the renal function was normal.

I believe diathermy to be the best treatment for this condition. There need be no fear of destroying the valve action of the lower part of the ureter, as the ureterocele is always distal to the portion of the ureter passing through the bladder musculature.

Obstructions of the Ureter.

Any attempt to discuss all the possible causes of ureteral obstruction would require space far beyond the limits of this paper. Hence it is proposed to describe only those which I believe to be of special interest.

Obstructions of the ureter are naturally divided into extrinsic and intrinsic.

Of the extrinsic causes I will describe only aberrant vessels, bands and adhesions and of the intrinsic only stricture and spasm.

Obstruction Caused by Aberrant Vessels.

Anomalies of the renal vessels are not uncommon and are of importance to the surgeon for more reasons than one. In the first place, an accessory vascular supply, if unrecognized, may be divided and troublesome hæmorrhage may result in the course of a nephrectomy. Anyone who has had an accessory vessel to the upper pole of a highly placed kidney get away from him, will always be very careful to guard against such trouble in the future. In the second place, aberrant vessels may, by their position and with the aid of other contributing factors, cause kinking and obstruction of the ureter.[5]

It has been the custom to speak chiefly of aberrant arteries, but anomalies of the veins do occur and can give rise to the same difficulties presented by the arteries.

Normally, the renal artery is single, arising from the aorta and dividing in a variable manner into three terminal branches, prepelvic and retropelvic and superior polar. Many variations may occur, including a number of separate arteries arising from the aorta, accessory arteries to the upper pole, to the lower pole and even vessels arising from the iliac artery. These vessels may pass either in front of or behind the ureter.

Much discussion has centred round the possibility of aberrant renal vessels of themselves giving rise to ureteral obstruction. Most people will, I think, admit that they do play a part in causing or aggravating obstruction, but given a normal kidney, normally placed, it is unlikely that the mere crossing of the ureter, which is by no means a rigidly fixed organ, by a blood vessel will cause obstruction. Still less likely does this become when one remembers that the ureter is not a mere flabby tube liable to indentation or bending by any structure pressing upon it, but a strongly acting organ with efficient muscular coats.

There must, then, be other contributing factors besides the mere presence of an aberrant vessel.

It is recognized that, if one anomaly is present in the urinary organs, there is always a strong possibility of another being present as well. This need not necessarily be any gross malformation, but quite possibly may be a slight alteration from the normal position or rotation of the kidney, sufficient to bring the aberrant vessel and the ureter into such relationship that the normal action of the latter is impeded. Such a state of affairs would account for those cases of congenital hydronephrosis associated with an aberrant vessel.

This alteration does definitely occur in cases in which, either from pronounced loss of weight, causing diminution of perinephric fat and excessive mobility of the kidney or from general visceroptosis, the kidney is so far displaced as to cause the ureter to kink over any obstacle to its downward path. Witness the woman, often multiparous, with lax abdominal walls and general dropping of the abdominal organs who developes a hydronephrosis. One operates and finds sometimes a ureter kinked over an aberrant vessel or a band which in her earlier years gave rise to no trouble whatever.

Another important contributing factor is infection of the urinary tract. Infection is apt to cause adhesions between the ureter and the aberrant vessel, thus making the ureteral kink permanent

and uncontrolled by posture and further may result in an inflammatory narrowing of the lumen itself.

This state of affairs is as a rule a subsequent development in a case in which some obstruction has been caused by excessive mobility kinking the ureter over a vessel, but I believe that sometimes infection *plus* an aberrant vessel is sufficient to cause obstruction in the ureter of a normally placed kidney. I will later describe a case in which this occurred.

Whatever the contributing cause may be, we know that the aberrant vessel plays a part, whether it is a functioning artery or vein or as is often the case, a mere fibrous remnant of its former self.

Obstruction Caused by Adhesions to the Ureter.

Adhesions to the ureter are certainly not uncommon. These may follow a severe urinary infection with periureteritis or may be due to abdominal or pelvic inflammation or may be post-operative.

Almost any abdominal inflammatory condition in the neighbourhood of the ureter may leave as a late complication adhesions and obstruction of the ureter. The right ureter is more commonly affected than the left, owing to the frequent possibility of adhesions following appendicitis. Another common cause of obstruction is adhesions in the neighbourhood of old inflammatory mesenteric glands. In addition to these I have seen adhesion and obstruction follow operation for removal of the caecum and ascending colon, psoas abscess, hysterectomy, pelvic cellulitis and vesiculitis.

The Treatment of Ureteral Obstruction Due to Kinking.

Very frequently when these patients come under observation, the condition is still further aggravated by the presence of urinary infection. As a rule this has been of some standing and has persisted despite a long continued course of medical treatment. In such circumstances, if the infection be comparatively quiet at the time of examination, all particulars as to the degree of dilatation above the obstruction and the kidney functions on either side should be determined. If the infection is acute, the least possible interference should be attempted and at most the condition may be temporarily relieved by catheterization of the affected ureter and pelvic lavage.

I believe that it is of very little value to estimate the renal function on the affected side in the presence of acute infection. The function in such circumstances is inhibited and one may gain an exaggerated idea of the damage to the kidney. Having reduced the infection to a quiescent state, one may then obtain the necessary information as regards function and dilatation.

In deciding on a plan of operative treatment it is exceedingly important to determine as far as possible the recuperative power of the pelvis. With the methods of investigation now in common use this is difficult and only a rough estimate can be obtained.

My own plan at present is as follows:

If the result of the renal function (indigo-carmine) test on the affected side is delayed beyond fifteen minutes, the other side being normal, and if the pelvic capacity is very large and especially if it has been difficult to obtain a definite "pain point" despite the subsequent pyelogram showing good filling, then I think that a nephrectomy will probably be called for, the final decision, of course, always being reserved for the conditions found at operation. This decision is reached because the conditions described point to permanent destruction of the contractile power of the pelvis.

If, on the other hand, the function is good and a definite "pain point" is reached (it being made certain, of course, that the tip of the catheter is in the pelvis) the degree of dilatation is of little account except in extreme cases, as there is an excellent chance of the pelvis recovering after the removal of the obstruction.

I will refer later to a new method of examination by means of which the contractile power of the pelvis can be accurately determined and which will, when the method becomes more generally used, be one of the most valuable indicators for the type of treatment to be adopted.

Operative Treatment.

The first point of attack in operating is naturally the site of the obstruction. Bands or aberrant vessels or adhesions in the neighbourhood of the kink are divided and the ureter carefully freed and mobilized for as much of its length as is accessible. The pelvis is examined and especially the ureteropelvic junction and the necessity or otherwise for plastic procedures for enlarging the lumen of the ureter is determined. Fortunately these are not often necessary.

In most cases the kidney will have been found lying at a low level in the retroperitoneal region so that when everything is freed, the ureter will be found to kink readily if the kidney is returned to its original position. Consequently some method must be adopted to fix the kidney in a sufficiently high position to insure that the ureter will be straightened out and so protected from further kinking in the future.

The operation of nephropexy fell into disrepute, along with the multitude of other "pexies," chiefly because many of the methods used were unsuitable and perhaps also because it was used in unsuitable cases. The author of one well known work on operative surgery describes twelve different methods of performing this operation many of which do not comply with the requirements of an ideal operation for fixation of the kidney.

The ideal operation for fixation of the kidney will:

1. Fix the kidney in a position as near to the normal as possible or in the case of a temporarily paretic pelvis in the position which will best aid emptying.

2. Will do this with a minimum amount of damage to the kidney parenchyma. Hence any of

the operations which necessitate passing sutures through the kidney substance are to be condemned.

3. Will not render the kidney liable to future trauma. In this connexion may be mentioned the fact that the kidney in its normal position in the body is well protected and capable of some movement, so that it is immune from injury by muscular movement or outside forces except in extreme cases.

Any operation which fixes the kidney to muscles, for example, the *quadratus lumborum*, or to osseous structures, for example, the twelfth rib, will render it constantly liable to twisting and bending with every movement of the lumbar spinal column. Apart from the pain which this causes, the constant trauma is likely to set up a traumatic nephritis with subsequent extensive contraction processes.

With these ideals in view the following operation was developed (Figure IV).

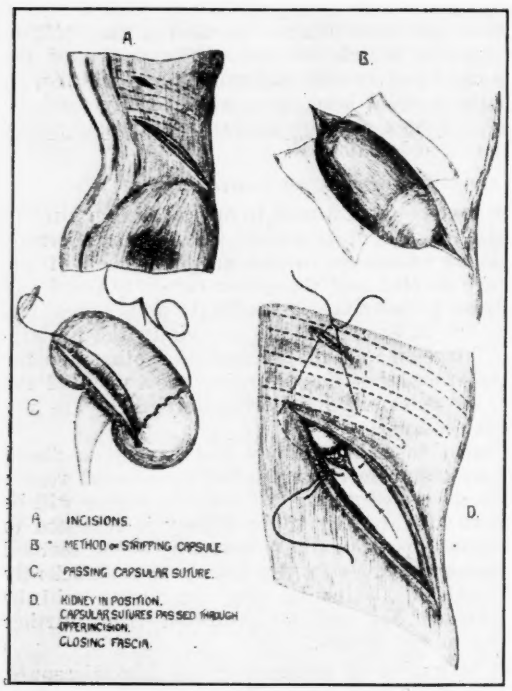


FIGURE IV.
Illustrating Operation.

The incision starts in the angle between the last rib and the *erector spinæ* muscle and passes obliquely downwards towards the anterior superior spine of the ilium, varying in length with the stoutness of the patient. The muscles are divided in the line of the incision as this gives better access and enables manipulations to be made with less force than is necessary when a muscle-splitting incision is used. If the cut muscles are carefully sutured, there is no weakness in the resulting scar.

The perirenal fascia is next divided and the kidney freed and delivered with as little trauma as possible, those points being cut through which do not separate easily rather than tearing with the fingers. The obstruction in the ureter is next sought and attended to and the ureter and pelvis are examined as far as the incision will allow. One often finds large tortuous veins on the upper part of the ureter in cases of obstruction. Some of these may require division in order to straighten out the ureter.

When all is ready for the actual fixation of the kidney, an incision is made in the capsule at the junction of the middle and lower thirds of the organ and is continued transversely round the anterior and posterior surfaces. From the centre of this incision another is made along the outer convex border of the kidney as far as the upper pole. The capsule is then stripped up on either side so that two wings are formed. These are rolled up on each side of the kidney, the upper two-thirds being left bare of capsule.

A number 3 chromicized gut suture is now passed through the lower end of the rolled capsule on one side and is tied, the ends being left long. One end is then passed in and out through the edge of the capsule which is still attached to the lower third of the kidney till it reaches the rolled capsule on the other side. It is passed through this and knotted, the end being left long.

A small transverse incision is now made through the skin over the tenth rib vertically above the upper angle of the first incision. The long ends of catgut are now threaded on long straight needles and are passed beneath the twelfth rib, the needle being kept very close to it, emerging at the upper border of the rib and passing obliquely to the incision above.

The kidney is now suspended in a sort of bucket made by the capsule of its lower third, from either side of which the sutures pass to the incision above. These sutures are held in one hand and gradually drawn upon as the other hand gently pushes the kidney up under the diaphragm. When the desired position is reached the sutures are tied. The perirenal fascia is now united from below upwards by interrupted catgut sutures and the incision is closed, mattress sutures of catgut being used for the deeper muscles and a continuous suture for the superficial. The two skin incisions are closed with silk-worm gut.

The chromicized sutures hold the kidney in position until the bare area of its surface becomes sufficiently adherent to hold the organ permanently in position.

When the renal capsule is too thin and friable I have made a sling by knotting catgut together and have thus supported the lower pole in a sort of hammock with the two long sutures attached.

This operation fixes the kidney in a high, well-protected position with the least possible trauma and with a minimum of shock to the patient. The patient is nursed flat or nearly so for a fortnight and is instructed to maintain a horizontal position as much as possible for another week.

I have performed this operation with occasional slight modifications thirty-seven times. The results have been very satisfactory.

One patient got no relief and I had to do a secondary nephrectomy, but in this case the ureteral obstruction had been of very long standing, the pelvis apparently had no power to recover from its dilatation which was very advanced and recurrence of pain called for more drastic measures. In two cases the infection which was quiet at the time of operation, later became acute, but responded readily to treatment. The remainder has been completely relieved.

Obstruction Caused by Ureteral Stricture and Spasm.

During recent years the subject of ureteral stricture has attracted a great deal of interest and has been the centre of much conflicting discussion. Because of the frequency of occurrence of stricture at the site of the normal narrowings of the ureter and because of the difficulty in diagnosis between the two conditions, I have elected to discuss ureteral stricture and ureteral spasm together.

One must first of all consider certain features of the anatomy of the ureter. A large number of careful *post mortem* examinations on young infants, from two and a half to nine months old,[6] has revealed macroscopically that there are three normal zones of narrowing in the ureter, namely, at the pyelo-ureteral junction, at the level of the iliac artery and at the bladder entrance. The ureter between these points is relatively dilated and shows an abdominal "spindle" and a pelvic "spindle." More detailed investigation of the pelvic ureter has shown another point of narrowing a short distance proximal to the bladder where the ureter is crossed in the male by the *vas deferens* and in the female by the uterine artery.

Microscopically the pelvis of the kidney and the ureter are shown to possess a muscular coat consisting of three layers of involuntary muscle, an outer longitudinal layer, a middle circular layer and an inner longitudinal layer. At certain points the middle circular layer is specialized to form little "ring muscles." These occur at the renal papillæ, at the neck of the minor calyces, at the neck of the major calyces, at the pyelo-ureteral junction, at the level of the iliac artery, a short distance proximal to the bladder and in the bladder wall itself.

Interesting work has recently shown that the papillary "ring muscle" is of spiral shape and it is at present surmised that this muscle exercises a milking action on the renal papilla, thus causing urine to flow from the tubules into the pelvis.[7] By a rhythmic muscular action the pelvis discharges its contents into the ureter and further muscular waves force the urine into the bladder. The unstriped muscle of the pelvis and ureter respond to such drugs as pituitrin and belladonna just as unstriped muscle elsewhere responds. Disease or obstruction in the urinary tract upsets the normal rhythm of the musculature of the pelvis and ureter, just as disease or obstruction in the bowel results in dilatation, spasm or paresis.

In considering the ætiology of ureteral stricture the three common factors presenting themselves are trauma, infection and malignancy.

Of the traumatic causes the passage of stones down the ureter is by far the commoner, while the other chief cause, fortunately not so common, is operative trauma.

Of the infective causes naturally urinary infection is the most important, whether it be infection with the ordinary pyogenic organisms or with the more chronic *Bacillus tuberculosis*. It has been contended that localized intrinsic inflammation of the ureteral wall, metastatic in character, may result from focal infection elsewhere in the body, but this has not definitely been proved. It is certain that extension of inflammatory processes from adnexal disease to the ureteral wall may cause a localized inflammation and subsequent stricture.

As it is proposed to consider only benign stricture here, malignant disease and tuberculosis will not enter into the discussion. Certain contributing causes should, however, be mentioned. It may be that the normal congenital narrowings of certain portions of the ureter are accentuated and that these aid other factors in causing a stricture. Further, the occluding power of other anatomical structures may assist in the causation, namely, aberrant vessels, the *vas deferens* and the uterine artery.

Incidence.

Several series of *post mortem* examinations have revealed stricture of the ureter of varying degree in 10% to 12% of cases, with or without latent symptomless hydroureter and hydronephrosis. This may seem a particularly high incidence, but one must remember the very large size which some hydronephroses and hydroureters reach before causing symptoms sufficiently troublesome to make the patient seek advice.

Symptoms and Signs.

The symptoms and signs of ureteral obstruction from whatever cause are too well known to require description here. I propose to deal particularly with the diagnosis and treatment.

Diagnosis.

One may say here that ureteral stricture may simulate many diseases of other organs and especially disease of the female pelvic organs. Owing to this simulation symptoms can never be an accurate guide and in many cases the real trouble is discovered only after numerous attempts, operative and otherwise, have failed to relieve the symptoms.

Perhaps the most common causes of confusion lie in gall bladder disease, appendicitis and retroversion of the uterus and dysmenorrhœa in the female. Consequently many of these cases are discovered only by a process of exclusion, the patients having finally come to a complete urological examination when all else has failed.

Complete urological examinations must, of course, be made in all cases, but there are certain special methods of investigation which must be used in order that a definite diagnosis of ureteral stricture may be formed.

1. *Instrumentation of the Ureter.* The passage of an ordinary ureteric catheter will usually give evidence of obstruction in the hands of those accustomed to its use and Hunner has elaborated the ordinary catheter by a bulb-shaped blob of beeswax moulded on the catheter a short distance from its tip.

The wax bulb is slowly pushed past the obstruction and then withdrawn and he claims that by the "hang" of the bulb at the site of obstruction, one is able to determine the presence or otherwise of a stricture.

I believe this method to be most uncertain. Certainly it will disclose whether the obstruction is or is not due to a mere kinking of the ureter because once the catheter is passed beyond the obstruction, if no actual narrowing of the lumen exists, it will be easily withdrawn without any "hang." It will not, however, determine whether the obstruction is due to stricture or to spasm. One cannot help feeling that many of the so-called ureteral strictures diagnosed by this method are really localized spasms of the ureter produced either by the passage of the instrument itself or from some other cause. Anyone experienced in the passage of ureteral catheters has felt sometimes a sudden stoppage which after a momentary pause disappears, and further progress is not impeded. At other times it is quite impossible to pass a catheter at all, yet at a subsequent sitting no difficulty is experienced and the catheter passes with ease.

This method, then, is quite unsatisfactory in establishing a definite diagnosis.

2. *Pyelograms and Ureterograms.* The outlining of the urinary tract by X rays after injection of opaque fluids was first used in the year 1906 and with progressive improvement in technique and the use of comparatively harmless fluids and more accurate interpretation has become one of the most valuable methods of urinary diagnosis. The injection medium now most commonly used is a 15% solution of sodium iodide, this being more nearly isotonic with the tissues than any other opaque fluid.

While making the injection, whether by the gravity method or with a syringe, one attempts to obtain an estimate of the capacity of the renal pelvis. It may be well to point out here some of the causes of inaccuracy in this measurement. In the first place the renal pelvis is a muscular organ possessing the faculty of expansion and recent work has shown that it is not a cavity of unchangeable size. Secondly, it is impossible to estimate how much of the injected fluid has escaped down the ureter. One must realize that owing to the length of the ureter it is capable of holding a considerable amount of fluid before any escapes at the orifice into the bladder. For this reason I have given up using coloured solutions for injection and watching the orifice for the colour to appear while injecting. Thirdly, one cannot hope to use a catheter which fits the ureter accurately, and so the flow into the ureter cannot be prevented. Fourthly, if the tip of the catheter is in a calyx or in the ureter just distal to the pelvis, the "pain point" will be reached long before the pelvis is full.

Pyelo-ureterograms, especially if taken in the sitting or semi-sitting posture, will certainly show displacements of the kidney and consequent kinking of the ureter either over aberrant vessels or bands of adhesion. Also the narrowing at the point of obstruction may be seen, but in many cases it is not possible to obtain an accurate estimate of the nature of the obstruction. The observation of certain points is a help in this estimation.

If the defect shown in the outline of the ureter is irregular or if the defects are multiple or accompanied by a fair degree of dilatation of the ureter above, with perhaps obliteration of the normal sharp outlines of the minor calyces, "clubbing" as it is called, then one may reasonably diagnose a probable intrinsic stricture of the ureter. If, on the other hand, the defect is regular in outline and especially if it is situated at one of the sites where the circular muscle coat is known to be well developed, then one may not diagnose organic stricture with any degree of certainty, as spasm cannot be excluded.

Serial pyelo-ureterograms may be a great help in such a case. If pictures are taken at intervals after the injection, a spasm may relax and the filling defect disappear, whereas a stricture will show a constant defect.

One must never lose sight of the fact that the ureter is a muscular organ working with rhythmic contractions, just as the alimentary canal does. No radiologist would care to examine the alimentary tract by the interpretation of films alone, as his most valuable information is obtained from watching the behaviour of the organs under the fluoroscope. Of recent years the same idea has been applied to examination of the urinary tract after the injection of opaque solutions.

3. *Pyeloscopy.*[8] Most of the credit for the most valuable advance of pyeloscopy must go to three French workers, Legueu, Fey and Truchot, who have published their work in a monograph under the title *"La Pyeloscopie."* With the aid of a specially constructed fluoroscope they have been able to observe the action of the pelvis and ureter after the injection of opaque fluids both in normal persons and those with obstruction or disease. By watching the pelvis during injection of the opaque fluid they are able to observe when it is full, without relying on the patient complaining when pain is felt and can see whether or not the injected fluid remains in the pelvis or escapes down the ureter.

One of their most interesting observations has been that the pelvic capacity, when the patient is fatigued, is much greater than and may even be double the capacity of the pelvis when the patient

has been resting before examination. The importance of this cannot be over-estimated, as it completely alters one's conception of the normal pelvic capacity.

As an indication for treatment also the fluoroscopic examination of the pelvis must become invaluable. A dilated pelvis, absolutely inert and of comparatively large capacity, would indicate nephrectomy, whereas a pelvis of the same capacity, but exhibiting good muscular power, would call for conservative treatment.

One feels that one of the greatest fields for this new form of investigation will be in the accurate diagnosis of ureteral stricture.

When the ureter can actually be observed for a period of time and the passage of its contents towards the bladder observed without interruption, the permanency or otherwise of filling defects will be readily established and the diagnosis between organic stricture and spasm will be certain.

Treatment of Ureteral Stricture and Spasm.

The treatment of ureteral stricture in the light of our present knowledge is far from satisfactory, as in most cases relief is only temporary.

With the exception of strictures in the region of the uretero-pelvic junction, I believe that operative treatment is useless on account of the inevitable scarring and subsequent recurrence.

A stricture close to the pelvis may sometimes be suitable for a plastic operation or an anastomosis between the pelvis and ureter. Organic strictures lower down can only be treated by dilatation with catheters, whalebone ureteral bougies or one of the special dilating instruments used through the cystoscope.

Strictures of the ureteral orifice are suitable for treatment by dilatation and as well may sometimes be still further relieved by slitting up the orifice with special scissors or the orifice may be enlarged by diathermy which leaves a very satisfactory scar in the bladder with little tendency to contraction. The period of relief after dilatation varies considerably, the longest period in my cases being seven months and the shortest six weeks.

Ureteral spasm causing painful symptoms is sometimes relieved by dilatation and sometimes responds to atropine or belladonna. If infection be present, the spasm will usually subside as the infection clears up. In every case of proved spasm I believe it is most important to make a thorough search for focal infection. In one of my cases the spasm which remained long after a urinary infection had subsided, cleared up magically after a previously unsuspected dental abscess had been dealt with.

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Reports of Cases.

A CASE OF BILE PERITONITIS.

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THE following case presents some features of interest and when the patient was first seen, the condition was difficult to diagnose.

A.D., a male, *ætatis* forty-eight years, had been seized six weeks previously with sudden pain in the right hypochondrium while lying down. The pain was present, but less severe, for three weeks and was accompanied by occasional vomiting which rather relieved it.

Three days prior to admission the same pain came on again and on the next day it moved into the right side of the chest and was worse on deep breathing. He had vomited twice with some relief. His appetite had been poor for some weeks. His bowels had been regular and there had been no urinary symptoms. Jaundice made its appearance within the last twenty-four hours before admission.

On examination he looked ill and was moderately jaundiced; the tongue was furred and dry. The abdomen showed slight but definite rigidity all over and was only slightly tender with no point of maximum tenderness. It moved on respiration. Respiration was jerky and its rate 40 per minute. No mass could be felt. Examination of the right side of the chest revealed diminished movement, dulness on percussion, absent breath sounds, ægophony and a friction rub below the right nipple. His urine was acid, its specific gravity was 1030 and it contained a heavy cloud of albumin and bile was present. The patient's temperature was 37·2° C. (99° F.) and the pulse rate 120.

The diagnosis was not clear. He had a definite right-sided pleurisy with effusion, but the abdominal rigidity was unlike that seen with pleurisy or pneumonia which is more localized to the side and more pronounced. The rise in temperature was unlike that of pneumonia on the third day; his respiration, though jerky, was not as laboured as that of pneumonia. The late Dr. Harry Clayton saw him in consultation and we agreed that the pleurisy was secondary to some unusual form of peritonitis and that he did not have pneumonia. Laparotomy was performed on January 20, 1926, and the abdominal cavity was found to be full of free bile. The gall bladder had some lymph present on the fundus and recent soft adhesions to the omentum, but no perforation or stone could be found in the gall bladder or ducts. The abdomen was drained. The next day he had a definite lobar pneumonia on the right side with signs as high as the middle of the scapula.

The pneumonia cleared up slowly and signs of consolidation and fluid were to be found in the chest for six weeks. His temperature took three weeks to come down to normal and he was jaundiced for twelve days. Four hundred and fifty cubic centimetres (fifteen fluid ounces) of turbid fluid were removed from the chest on one occasion and contained pus, endothelial and a few blood cells and was sterile on culture. No tubercle bacilli were found in it. Bile drained from the tube for three or four days only and then ceased.

These cases of bile peritonitis without perforation are not common, but are so well known that a controversy has arisen as to their mode of origin. Apart from the cases in which a cause for extravasation of bile is obvious, such as perforating wounds, gangrene or ulceration, there is a group in which a large quantity of bile is present in the abdominal cavity, but neither operation nor autopsy, if any, reveals any perforation of the biliary tract.

There are two rival theories as to its causation:

1. The filtration theory. In the presence of obstruction of the common bile duct, bile may exude through the uninjured walls of the gall bladder or ducts into the peritoneal cavity.

2. The ulceration theory. A small area of ulceration, infective or traumatic, appears usually in the gall bladder which perforates the wall and allows extravasation of bile probably intermittently. By the time sufficient has accumulated to demand operation, the small opening is closed and cannot be found.

This latter seems the more reasonable explanation. In most cases patches of lymph or recent plastic peritonitis are found about the gall bladder or ducts.

According to Cope[1] the symptoms are very variable. The onset may be acute or gradual; jaundice may be present or absent; gall stones may or may not be found; the temperature may be subnormal, normal or elevated; abdominal tenderness, rigidity and distension are variable. The most constant feature is the remission of symptoms.

Probably in the case reported here bile was escaping intermittently for six weeks in small quantities and the greatest amount was extravasated three days before admission, to be followed by sealing of the small opening and pleurisy and pneumonia.

Reference.

[1] Zachary Cope: "Extravasation of Bile," *The British Journal of Surgery*, Volume XIII, 1925-1926, page 120.

Reviews.

A HAND BOOK FOR DIABETICS.[1]

A BOOK that can be highly recommended to patients and that will well repay a physician's time given to reading it, is "Diabetes, its Treatment by Insulin and Diet," by Dr. O. H. Petty, of the University of Pennsylvania.[1] The subtitle "A Handbook for the Patient" is not, as in many books, a misnomer: for it is clearly expressed and, though technical terms are used, they are carefully explained and defined.

The book is thoroughly up to date and in this respect unlike some of the hand books by writers who have attained a reputation, and whose views have become somewhat obsolete since their mental inertia has prevented them from examining scientific advances without prejudice.

On the first page of the book is the statement "Since the starvation diet has been discarded by the majority of physicians many potential diabetics follow an accepted preventive diet." There are two inferences that should be drawn from this sentence. The first is the fact that starvation has been proved incapable of giving the pancreas physiological rest in many cases and that it is unnecessary in all others and the second is that a preventive diet is the method accepted by a majority of physicians. Throughout the book the author gradually instructs the patient as to what this diet is and why it is the most satisfactory possible.

He gives the patient from the beginning thirty calories per kilogram of "ideal body weight" which he calculates by subtracting 10% from the average weight at the patient's age. It would be simpler to give a smaller number of calories per kilogram and to take the average weight as the guide, say twenty-five calories per kilogram, the average weight for age table being used. He allows 0·6 to 1·0 gramme of protein per kilogram of body weight and a proportion between the glucose and fatty-acid of 1·0 to 1·6.

Such an allowance of calories and such an amount of protein and also such a ratio of glucose to fatty-acid is in conformity with modern metabolic knowledge, being accepted by the clinicians who have absorbed the ideas developed by Schafer and others. Perhaps the practical adjustment of dietaries is not quite so simply arranged as by Lawrence in his line ration scheme or by Winn in the MEDICAL JOURNAL OF AUSTRALIA of March 5, 1927, but it is sufficiently clear.

It is in the explanation of the scientific principles on which diabetic treatment depends, that this book is so sound. The principles are very clearly expressed and illustrated by diagrams that make such terms as glycogenolysis, glycogenesis and glucolysis actually intelligible.

It must not be thought because the author calmly states the fact that starvation has been superseded, that he advocates excessively high diets; the fact is that he merely stresses the fact that physiological rest to the islands of Langerhans can be best secured by a moderate reduction in the calorific requirements with the amount of carbohydrate protein and fat in proper proportions. Repeatedly he refers to the fact that patients who are 4·5 to 9 kilograms (ten to twenty pounds) under the average weight, have been found by insurance statistics to be the best risks and that patients who are only 2·25 kilograms (five pounds) over weight, have been found to have a mortality rate of 9% higher.

This book contains the usual list of foods with their proportions of carbohydrate protein and fat, a large variety of recipes and valuable hints concerning apparatus and methods for weighing food. It contains as well a list of foods with the content of vitamin *A*, *B* and *C* in each and the "salt" content of a great number of foods is also listed.

Full particulars concerning the use of "Insulin" and the proper care of the syringe *et cetera* are to be found. It may be stated incidentally the author advises a tuberculin syringe with a blue glass piston for facilitating reading the dosage rather than any other type of syringe.

Nine pages of actual diets are to be found including several described as "soft or toothless."

The author breaks away from tradition by classifying vegetables as 3% and 6% instead of 5% to 10% and thus "avoids burdening the memory with two values one of which is erroneous."

[1] "Diabetes, its Treatment by Insulin and Diet: A Handbook for the Patient," by Orlando H. Petty, A.M., M.D., F.A.C.P.; Fourth Revised and Enlarged Edition, 1928. Philadelphia: F. A. Davis Company. Post 8vo., pp. 155. Price: $2.00 net.

A TEXT BOOK OF PRACTICAL PHYSIOLOGY.

SIR EDWARD SHARPEY-SCHAFER'S practical text book, "Experimental Physiology," has now reached a fourth edition.[1] As might be expected from a veteran teacher, the book is eminently practical and contains no directions which the author has not himself repeatedly carried out. At the first glance the reader might be tempted to comment on the familiarity of the diagrams and exercises, but reflection would tell him that a large number of what we might call classic exercises, owe their existence to Sir Edward's genius as a teacher. One criticism and one only will we venture to make. Anyone who has examined the capillary circulation in the distended bladder of the frog, will assuredly prefer this method to those in which web, mesentery or other organ is employed. The book is admirably suitable for university classes of physiology.

[1] "Experimental Physiology," by Sir Edward Sharpey-Schafer, F.R.S.; Fourth Edition; 1927. London: Longmans, Green and Company. Demy 8vo., pp. 147, with illustrations. Price: 6s. net.

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A Retrospect.

Urology.

THERE has been a considerable amount of steady work done during the year 1928 on problems connected with the urinary organs. Mention should be made of the development of the department of urology at the Royal Prince Alfred Hospital, Sydney, which was founded two years ago. The scheme depends in part on the institution of research into the physiology and pathology of this branch of surgery. A biochemist has recently been appointed to undertake investigations in his special line of work.

Attention has been drawn by Reisman and De Sanctis to the unsuspected frequency of perinephritic suppuration in children. They have studied the ætiology of this condition and make some valuable suggestions in regard to the treatment. Auramovici has described the lesions which occur in the kidneys during an attack of syphilis. He warns the medical profession against the use of drugs which are eliminated at a slow rate. The damage done by these drugs may not become manifest for some years. Corbus and Bamforth emphasize the desirability of a pyelo-ureterographic study at intervals after the apparent cure of pyelitis of pregnancy. In this way any mechanical cause of persistence of the infection may be detected.

Cummins holds the opinion that catheter drainage and lavage of the renal pelvis is the only treatment of any value for polycystic disease of the kidney, but that it is merely palliative, not curative. It helps to control hæmorrhage and to limit infection. Delzell and Harrah find that slight violence may lead to rupture of the kidney if it is in a state of hydraulic tension. This finding should be remembered in compensation claims. Eisendrath has pleaded for an extension of the use of the inlying ureteric catheter. He states that it may be left *in situ* on one or both sides for several weeks at a time without harm, provided that the proper technique has been adopted.

In regard to diseases of the bladder carcinoma still holds the first position as a problem of great difficulty. Barringer has developed the technique of radium implantation. He favours the use of emanation, not in glass seeds as was formerly employed, but in gold seeds. This covering substance causes little irritation and sloughing. McCrea has investigated the effect of *tabes dorsalis* on the bladder. He distinguishes an incontinent group of patients in whom the sensation is cut off from the higher centres by degeneration of the posterior columns, and a paretic group of patients in whom the reflex function of the bladder is impaired as a result of lesions of the afferent fibres of the pelvic autonomic nerves. The distressing bladder symptoms of obscure cause from which women so frequently suffer, have been studied by several workers. Lau and de Vries draw attention to the fact that urethral stricture is often the cause; as a rule it is overlooked. Bullous œdema or cystic degeneration near the neck of the bladder may be the cause. They state that fulguration may be needed to effect a cure. Marion and Delsace have found that in cystalgia with apparently clear urine occurring chiefly in women, staphylococci or *Bacillus coli communis* can almost always be discovered. They advocate lavage with solutions of oxycyanide of mercury in place of the usual vesical instillations.

When vesical tuberculosis remains intractable from any cause Ormond performs extraperitoneal ureterostomy in the inguinal region. The opening is readily reached in this area and a catheter leading to a rubber bag can be worn in the urethra.

S. Harry Harris has devised a special system of hæmostatic sutures at the neck of the bladder for the purpose of securing primary closure of the

bladder after prostatectomy. This is combined with an original method of reforming the floor of the prostatic portion of the urethra. Pennock and Stark deprecate the use of the punch operation for median vesical bar and fibrosis of the bladder. They advocate a suprapubic excision of the affected tissues with the aid of sight. von Lackum has recorded the experience gained at the Mayo Clinic in regard to a large number of patients suffering from prostatitis. From the data available it appears that the results of treatment are far from ideal. Casariego holds that early prostatotomy, though apparently a more severe procedure than seems to be justified as a routine method, is in fact a conservative measure in acute prostatitis, as it renders a greater degree of preservation of function possible than do the usual methods.

Kreutzmann has carried out some interesting work on the cause of back pressure in obstruction of the lower part of the urinary tract. He concludes from his radiological and other studies that the commonest cause is constriction of the intramural portion of the ureter by the hypertrophied bladder muscle surrounding it. Pérard has published the details of a new method of restoring the anatomical condition and the physiological function of the female urethra after serious damage in labour. Two stages are required. The mucosal graft is made to lie in a newly constructed urethral channel.

Treatment of persistent priapism by needle aspiration of the *corpora cavernosa penis,* followed by lavage, is advocated by McKay and Colston. Huhner holds the opinion that no operation for the relief of sterility in the male should be undertaken until the diagnosis is confirmed by aspiration of the testis. This doctrine was taught by Posner several years ago. Dillon and Cody have found that in certain obscure conditions associated with pelvic pain phleboliths are present. These stones are formed in connexion with venous varicosities which readily cause pain.

Radiology.

There has been little advance on the mechanical side of radiography during the year 1928. Several English and Continental firms have been experimenting with valve rectification of high tension currents and have placed suitable apparatus on the market. It is anticipated that the valve rectified unit will shortly be in universal use. It is simple and noiseless in operation and when coupled with direct current supplies the rotary converter can be placed at a distance from the X ray room.

The "Metalix" tube has been coming rapidly into favour. It is a very safe tube as far as the operator is concerned. It is capable of carrying high *milliampèrages* at high voltage and gives excellent definition in all classes of work. We learn that at one large public hospital in Australia one of these tubes has been used for about twenty thousand exposures.

An increasing number of radiologists appears to be giving preference to certain high class apparatus made by German firms.

Many attempts have been made to popularize the flat Bucky diaphragm, but for ease in manipulation and uniformity of results the older curved type of diaphragm still holds its place.

All modern machines embrace simpler forms of manipulation and with the introduction of the standard instruments of precise measurement, uniform exposures are becoming possible.

In close connexion with the mechanical aspect of X ray apparatus there is the physical. Some important work has been carried out in the Physics Laboratories at the University of Sydney by W. H. Love on the evaluation of the energy liberated by homogeneous radiation on living tissue and on the evidence that X rays of given wave lengths exert a selective action on tissue, while rays of another wave length produce ineffective results. He sets up a theory to explain the inhibitory action of a mixture of effective and ineffective radiations. A continuation of this study is likely to reveal the biophysical nature of the action of certain penetrating rays and may enable radiologists to apply rays of selected wave length in order that definite effects will be produced on normal and pathological tissue cells.

A considerable amount of work has been conducted on cholecystography. Sherwood Moore still prefers the intravenous administration of the dye. Other workers, including Stewart, Ryan and Lockwood, prefer the oral method. There is still some difference of opinion concerning the technique to be followed, but it seems that in competent hands reliable results may be attained in various ways.

Taylor has made a special study of the radioscopic appearances of the mastoid region. He finds that the character of the cells can be determined and that certain types of pathological processes can be recognized. The otologist has yet to learn the real significance of the radiological examination of this region.

Many radiologists advocate the use of "Lipiodol" for the diagnosis of pulmonary affections. In another chapter of this series of articles the opinion has been expressed that this drug is intensely irritating and by no means free from danger. While it may enable the radiologist to secure good definition of the lung tissue, caution must be exercised until it has been ascertained whether or not subsequent harm is inflicted on the patient's lungs. The same applies to its use for demonstrating blockage of the Fallopian tubes. On the other hand, it is held that iodized oil introduced either through the crico-thyreoid membrane or through the larynx after cocainization of the pharynx is a safe procedure. The oil is said to trickle through the bronchial tree and in the skiagram the outline of the bronchi can be clearly demonstrated. The oil is gradually dissociated and the iodine absorbed. This should have a beneficial effect.

Sear has contributed a highly important article on the differentiation of the several forms of osteitis, particularly of *osteitis deformans* and *osteitis fibrosa*. His work has helped to clarify the position in regard to the pathology of osteitis.

In the chapter of radio-therapy the first place naturally belongs to the treatment of malignant disease. This subject has been mentioned in a previous chapter. It is evident that much progress has been made and that a healthy criticism has been introduced that will check undue optimism while it encourages experiment and rational application.

Kromeke has found that X radiation induces an injurious effect on erythrocytes. After small and medium doses the injury is reparable and the continued action leads to regeneration. After large doses the damage is permanent.

Ultra-violet radiation is attracting much attention. It has been known for a considerable time that the five octaves of rays lying immediately outside the visible spectrum and in front of Röntgen rays have a curative effect in certain pathological conditions including rickets, some skin affections and possibly tuberculosis. The action of ultra-violet rays on certain foodstuffs, lending to them an effect akin to that of certain vitamins, was noted a few years ago and complicated the problem. The present position of ultra-violet radiation has recently been well set out by J. Bell Ferguson. He points out that it increases the bactericidal power of the blood, exerts a direct bactericidal effect on surface organisms, has a detoxicating effect on certain toxins, increases the retention of calcium, phosphorus and iron in the body, stimulates metabolism, has an analgesic effect on the skin and so forth. The method of action of its bactericidal power has been studied by Clark and by Bedford. The former holds that the rays act upon the proteins of the bacteria, presumably dissociating them. Lewis and Zotterman have shown that ultra-violet rays set free a vasodilating substance in cutaneous blood vessels. Bedford has put forward the hypothesis that the bactericidal action is dependent on the production of hydrogen peroxide in the bacteria. These suggestions are useful, although evidence of their validity is wanting. On the other hand there has been much direct evidence that ultra-violet rays have a bio-physical action on the calcium content of tissue cells within the range of the penetration of the cells. Excessive doses of the rays depress metabolism, irritate the skin and have a destructive action. Little or nothing is known regarding the alleged tonic action of these rays. It would seem that there is danger that a therapeutic effect may be assumed where none exists in reality.

Until some unmistakable evidence of this elusive action is forthcoming, it would be well to adopt an attitude of healthy scepticism.

Bacteriology and Immunology.

Among the more important investigations that have been carried out and the results published in 1928 on bacteriological and immunological subjects the artificial transmission of yellow fever to animals deserves the first place. Stokes, Bauer and Hudson report that they have succeeded in transmitting yellow fever to monkeys. They used *Macacus rhesus*. The inoculum consisted of the citrated blood collected from human patients in the early stages of the disease. Attempts to cultivate the virus were unsuccessful. Monkeys were protected against infection with the virus by the injection of 0·1 cubic centimetre of serum from a person convalescent from yellow fever. Hindle has prepared a phenol glycerine vaccine from the liver and spleen of infected monkeys. It is suggested that this vaccine may confer protection against yellow fever in human beings.

The important question whether disease caused by filterable viruses can be prevented by immunization with killed virus has been dealt with in the report of the Foot-and-Mouth Disease Research Committee of the Ministry of Agriculture. The members of this committee have accepted as a fact that protection can be afforded by the injection of a virus killed with formalin.

The application of serological methods to the diagnosis of infections by filterable viruses is a further advance in the study of these diseases. Gordon states that specific antibodies are present in the serum of rabbits suitably treated with vaccinia, possessing an equal affinity for the viruses of vaccinia and variola. This can be demonstrated by means of complement fixation, agglutination and precipitation tests. Evidence has been collected to prove that serum prepared in this manner against vaccinia virus can be employed for the diagnosis of small pox. Ciuca has succeeded in adapting the complement fixation test to the diagnosis of foot and mouth disease. In doing so he has been able to distinguish two different types of the disease.

Hamilton Fairley has investigated the effect of the injection of protein-free, alcohol-soluble extract of fresh livers of *Planorbis* infected with bilharzia cercariæ into living animals on antibody production. The uniformity of the serological results is said to prove that the extracts employed act as true antigens. He suggests that these extracts may be used for provocative injection in the diagnosis of the condition, if the available evidence is inconclusive. A decisive rise in antibody content of the serum, occurring within a few days of the first injection, is pathognomonic of infection with *Schistosomum*. Rackemann and Stevens suggest that the intradermal injections of the extracts of other helminths might prove as useful in diagnosis as does the extract of echinococcus. Fairley and Williams have described a new intradermal skin test for schistosomiasis. The antigen is derived from dried, powdered livers of snails infected with bilharzia cercariæ.

Davidson has attempted to solve the problem of the pathogenesis of pernicious anæmia. He has studied the bacterial contents of the alimentary canal. In every patient achlorhydria was present. He failed to discover any evidence of the association with pernicious anæmia of any particular variety of bacterium in the lower part of the small intestine. He found coliform bacilli, streptococci, *Bacilli acidophili* and *Bacilli welchii*. Of the organisms recovered from the gastro-intestinal contents he considers that *Bacillus welchii* has the best claim to ætiological significance. It is stated that the absence of hydrochloric acid in the stomach enables a pathogenic organism to gain entrance into the intestinal canal and thence into the blood. There is, however, no reason to assume that the virus of pernicious anæmia gains access to the organism through the gastro-intestinal canal or that even if it did so, it would be found in the intestinal contents.

Peel has isolated an organism similar to that described by Gibson from the spleen of a child suffering from Banti's disease. He considers it to be a fungus rather than a member of the streptothrix group. It is pleomorphic and does not ferment any of the carbohydrates commonly used for this

purpose. Primary culture from the spleen is said to be difficult, although subsequent growth in subcultures occurs readily.

L'Esperance has inoculated five healthy chickens intravenously with emulsions made from the lymphatic glands of two patients suffering from typical Hodgkin's disease. All the chickens developed tuberculosis. Reinoculation of the material from the lesions of one of the chickens into another chicken produced an identical albeit more extensive form of the disease. Bryce has carried out an investigation into the bacterial flora of the female genital passages in pregnancy and the puerperium with special reference to puerperal infections. She has shown that it is fallacious to regard the presence of streptococci in the genital passages as evidence of their causal relationship to any disease that may exist in the patient.

The members of the Royal Commission appointed to inquire into the causes of the fatalities at Bundaberg following the administration of diphtheria toxin-antitoxin mixture consider that the available evidence points to the injection of living staphylococci as the cause of death. The staphylococci were introduced accidentally into a bottle of the mixture which contained no antiseptic. The organism isolated was found to be identical with a staphylococcus isolated in pure culture from abscesses at the site of inoculation of five of the surviving children. It was found to be slightly pathogenic to guinea-pigs, mice and monkeys; when given intravenously to rabbits in relatively small doses it led to death in from twelve to twenty-four hours. It is morphologically a member of the *Staphylococcus pyogenes* group, although its colour on solid media is intermediate between typical *aureus* and *albus*. When grown *in vitro* for eight hours it is capable of yielding toxin which produces specific skin reactions in a dilution of one in two thousand in susceptible individuals.

Some interesting work on bacteriophage has been conducted notably by Burnet, Nelson and Ross.

Hygiene.

The term hygiene is so wide that, if its real definition were adopted for the purpose of this series of articles, there would be no need for chapters on bacteriology and immunology, medicine and some other subjects. Although preventive medicine belongs to hygiene, it has been found more convenient to include some of its problems under other captions.

The international aspect of hygiene has been developed very rapidly during the past few years. The International Sanitary Convention of 1912 was amended in 1926 to bring the procedure and practice of maritime quarantine into line with modern knowledge and requirements. Australia became a signatory to the new convention with the deposit of ratification on September 6, 1928. Australia became a signatory to the international agreement respecting facilities to be given to merchant seamen for the treatment of venereal disease on August 23, 1928. The International Pacific Health Conference held in Melbourne in December, 1926, laid the foundation for the coordination of research and of the application of measures to preserve the health of peoples. During 1928 a step forward has been taken by the appointment of a mission of inquiry through the western section of the Pacific by the Health Organization of the League of Nations. The members of the mission, R. W. Cilento and P. Hermant, are at present engaged in this work.

Among the numerous activities of the Health Organization of the League of Nations during the year mention may be made of the continued distribution of epidemiological intelligence from Geneva and for the far east from Singapore, the work of inquiry on standardization of biological and serological products, on variola and vaccination, malaria and cancer, the revision of the International List of Causes of Death and the nomenclature for morbidity statistics. Among the pending studies those on leprosy and ship fumigation should be noted.

In the course of 1928 there was a recrudescence of yellow fever in Brazil, while in the tropical districts of West Africa it seems that yellow fever has become somewhat more prevalent. Valuable work has been carried out by the Yellow Fever Commission of the International Health Board of

the Rockefeller Foundation. The view that *Leptospira icteroides* is the cause of the disease has been abandoned and it is now held that the virus belongs to the class of filterable organisms. As has been mentioned elsewhere in these articles, yellow fever has been conveyed to *Macacus rhesus* by direct inoculation of infected blood and by bites of infected *Ædes ægypti*. The work has taken its toll of life. During the period of the earlier Commission Lazear lost his life in 1900. Three distinguished workers died in 1928 from yellow fever, Adrian Stokes, Hideyo Noguchi and W. A. Young.

The Industrial Fatigue Board of Great Britain has instituted many inquiries during the year. The subjects include the determination of the hours of work in relation to the value of rest pauses during long spells and to the double shift system for women, the physiology of ventilation with special reference to heating and lighting, accident causation, vocational guidance and so forth. It is becoming daily more evident that improved conditions of work are beneficial alike to employers and to workers.

The second session of the Federal Health Council was held in Melbourne in March, 1928. The Council, after conferring with the Commonwealth and several State statisticians, discussed the various aspects of morbidity and mortality statistics with a view to the adoption of a concerted basis of action. A report was considered on the action taken in respect to the resolutions of the first session of 1927. Following on the recommendation of the Council, the Inspector-General of the Insane, Victoria, is carrying out an inquiry concerning the extent of mental deficiency in Australia and is submitting a full report to the next session of the Council. The Commonwealth Government is making preliminary arrangements for conferences to be held in each State for the purpose of obtaining uniformity in regard to the Pasteurization of milk in the metropolitan areas, the bottling in sealed bottles of sterilized milk and the grading of milk according to standards of bacterial content. Inquiries are also being made into schemes of compensation in operation in the several States and in certain other countries in connexion with animals suffering from tuberculosis.

Considerable advance has been made during the year in Victoria and New South Wales in connexion with the control of tuberculosis. In New South Wales the scheme outlined by the Tuberculosis Board of Control is being adopted. It has as its basis the development of a system of tuberculosis clinics operated in association with the main general hospitals and the coordination of the activities of sanatoria and other institutions concerned with the treatment and education of tuberculous patients. The appointment of a director of tuberculosis in the Department of Public Health of the State has been the means of putting this work on an efficient footing. In Victoria a director of tuberculosis has been appointed in the Department of Public Health of the State and a comprehensive scheme of control has been planned. This includes the establishment of a central departmental clinic with branch clinics situated on the basis of one clinic to each three hundred thousand of population. The coordination of the activities of sanatoria and hospitals is subjected to the general supervision of the Director who controls the admissions to the several institutions and the transferences from one to another.

The Health Organization of the League of Nations has at the request of Professor Calmette commenced an investigation into his claims on behalf of the Calmette-Guérin bacillus vaccine. Pending the publication of a report on this investigation it will be advisable to suspend judgement and to rely on other measures.

In regard to venereal diseases the Health Organization of the League of Nations is carrying out some important inquiries into the relative value of serological reactions in the diagnosis of syphilis. The investigations will also embrace an evaluation of the end results of treatment. The Division of Tuberculosis and Venereal Diseases of the Commonwealth Department of Health has been engaged during the year in a survey of the present position in each of the Australian States in regard to the control of these diseases. A report containing proposals concerning measures for future control is

being submitted to the Federal Health Council at its next session for consideration.

In the realm of public health engineering substantial progress has been registered in several directions. Bio-aeration is becoming increasingly popular as a method of sewage treatment. Some advance has been made toward the solution of the sludge disposal problem. Hatton at Milwaukee claims to have achieved success in sludge pressing and in the sale of pressed sludge as a fertilizer. Imhoff in Germany and various English and American workers have developed the practice of digesting the activated sludge after seeding with ripe sludge taken from Imhoff or separated sludge digestion tanks. Several new methods of aeration have been devised, but have not yet been widely adopted. The disposal of creamery and abattoir wastes has been elucidated to some extent by the researches of Rudolf and Levine in America and Kessener in Holland. Much work remains to be done in this field. While advance has been achieved in the science of water purification, it is in the direction of the improvement of existing processes rather than in the discovery of new methods.

Industrial hygiene has made important progress during the year. The provision by employers of systems of medical service to their workers is steadily increasing. Rest rooms, cloak rooms and dining rooms for the use of employees are being installed in many factories. In many industrial awards rest periods for females during long working shifts are prescribed. Investigations carried out by the female medical inspector of the Victorian Department of Labour and by the Medical Officer of Industrial Hygiene of the New South Wales Department of Public Health have brought to light many unsatisfactory working conditions in factories and have led to their rectification. Following on the recommendations of the Industrial Hygiene Conference held in 1927 a survey of the conditions under which female labour is employed in Victorian factories was undertaken by the Division of Industrial hygiene of the Commonwealth Department of Health and the causes of accidents to minors reported to the labour departments in New South Wales, Victoria, Queensland and South Australia and to the New South Wales Government Railways and Tramways have been studied by a special committee appointed by the conference. At the request of the Commonwealth Court of Conciliation and Arbitration the Industrial Hygiene Division has also investigated the physical and working conditions of persons employed in gas making and in the mining industry in Victoria and Tasmania. The occurrence of dermatitis among rubber workers in Australian factories has been the subject of inquiry. The cause of the trouble was found to be certain of the accelerators used. Since these have been excluded, practically no further skin eruptions have been noted.

Two valuable inquiries have been completed during the year, one by the Pennsylvania Department of Labour and Industry and the other by the American National Safety Council into the hazards connected with applying lacquers or paints by spray. Three specific dangers to health were found: benzene in lacquer, lead compounds in paints and silica in vitreous enamels.

The Commonwealth Government, after having taken into consideration the increase in the incidence of cancer and the possibility of taking some national action, decided to purchase a sufficient supply of radium for the demonstration in each State of its value in the treatment of the several forms of malignant disease. Ten grammes of radium were obtained and this quantity has been distributed to the several States. Advantage has been taken of the opportunity to arrange with the State authorities for the initiation in one hospital in each metropolitan area of a treatment centre at which all modern facilities for the treatment of cancer will be provided.

The erection of the new School of Hygiene and Tropical Medicine at the University of Sydney is proceeding and the plans and elevation have been published. The importance of this school as a training centre for practitioners wishing to take up preventive medicine and hygiene as a career need not be emphasized. It will be remembered that in 1925 the Royal Commission on Health recommended the establishment of the school at the University of Sydney in its report.

Abstracts from Current Medical Literature.

OPHTHALMOLOGY.

Air Embolism of the Retinal Vessels.

H. BARKEN (*Archives of Ophthalmology*, July, 1928) describes the manifestations of air embolism in the retinal arteries. Air embolism follows various diagnostic or therapeutic procedures in diseases of the pleura and the lung. Roger in 1864 related a case of a child of eight years who became unconscious following an irrigation of a chronic empyema and in whom blindness occurred. About sixty cases have been reported. von Weber first reported the ophthalmoscopic condition in a man of twenty-five operated upon for lung abscess. Air bubbles were seen in the retinal arteries as silvery glittering rods. At the autopsy the arteries of the brain were full of air. Experimentally air has been injected into the carotid of monkeys. After a few seconds the entire fundus, especially the retina about the macula, contains innumerable very fine glittering lines like spider nets. Five minutes after the injection the fundus becomes normal again. The author's patient was a man of thirty-five who was operated upon for a foreign body in the bronchus and lung abscess. The patient collapsed and was blind for twenty-four hours. At a subsequent operation he became amaurotic for six days. His eyes were not examined until some months later. Vision was $^{9}/_{10}$ and the campimeter revealed a homonymous scotoma. The author believes this to be the result of destruction of portion of the calcarine fissure due to air embolism.

Vaccine Treatment of Eye Diseases.

H. J. HOWARD (*American Journal of Ophthalmology*, September, 1928) recalls the fact that local inflammation may sometimes be relieved or even cured by a severe intercurrent infection. A gonorrhœal infection is rarely seen coexisting with a febrile disease. This is due to the heat sensitivity of the gonococcus, but the same reason does not apply to all organisms. In 1918 Wagner von Jauregg published his results in the treatment of general paralysis by the injection of malaria infected blood. For gonorrhœal infections of the eye the use of milk injections may be considered one of the great discoveries of this century, but in inflammation of the deeper ocular structures the use of milk has been disappointing. For the last three years the author, working in Pekin, has been using intravenous injections of typhoid-paratyphoid vaccine for many acute infective diseases of the eye. A stock vaccine is used, one cubic centimetre of which contains 1,000 million typhoid bacilli, 750 million paratyphoid *A*, 750 million paratyphoid *B*, making a total of 2,500 million. To one cubic centimetre of the vaccine nine cubic centimetres of normal saline solution are added. To one cubic centimetre of this dilution nine cubic centimetres of normal saline solution are added. Then one cubic centimetre of the second dilution contains 25 million bacteria, the usual amount of the first dose. About half an hour after the dose the patient has a rigor lasting for an hour or more. This in the author's experience heralded a high fever (39° C.) in a few hours. This was generally followed by a fall, after which the temperature rose higher still (40° C.). Then there was a fall by lysis to normal in thirty-six to forty-eight hours. The second dose is given twenty-four hours after the fever from the first dose has subsided, usually on the third day. Death resulted in one patient from the second dose being given during the author's absence at the height of the fever from the first dose. The temperature reactions from the second dose were rarely longer than eighteen or twenty-four hours, that following subsequent doses about ten to fifteen hours. The second dose contained usually fifty million, the third one hundred million and so on until at the ninth or tenth dose a whole cubic centimetre of vaccine was given. Its use is indicated as a prophylactic in perforating wounds of the eye and in all acute inflammation except those of a tuberculous nature. The therapeutic effect is proportional to the height of the fever and without fever no effect is obtained.

Suture in Cataract Extraction.

C. N. SPRALT (*American Journal of Ophthalmology*, May, 1928) applies his suture in cataract extraction in the following manner. He calls it the pocket flap extraction. A horizontal incision, about two centimetres long and five millimetres above the limbus, is made in the conjunctiva. This is dissected downwards to the limbus and extensions are made on each side to expose the upper two-fifths. A mattress suture is placed in the centre of the two edges of the conjunctival wound. It is tied loosely with one knot above and drawn aside. The corneal section is then made and the extraction completed with or without iridectomy, as desired, the conjunctival flap being held firmly down over the cornea. The second knot in the suture is then made.

Trachoma.

A. SOLARES (*Revista del Instituto Medico*, January, 1928) thinks that the statement made by some authors that trachoma does not exist in Bolivia is due to lack of recognition of the disease by practitioners of that country. He observed the disease first in 1913. There was a sharp epidemic especially among the school children of Sucre in 1916-1917. He believes with other South American writers that the disease is not indigenous to that continent, but it would be difficult to trace its introduction. Reviewing his statistics he finds that among 7,585 patients under treatment for eye conditions 2·45% were suffering from trachoma. This is a low percentage compared with statistics quoted from other countries. Most of his observations were made in the high lying areas of the republic. He considers that in all likelihood there exists a higher percentage of persons suffering from trachoma in the humid low lying plains. The condition observed presented the following characteristics. Granulations were usually discrete and of small to moderate size. Exceptionally were they large and confluent. Complications were rare, being present in only thirteen patients. Five of these patients were foreigners who were probably infected before they reached the republic and came from countries where the hygienic conditions of persons in their class of life were inferior. This relative mildness of the disease is thought to be due to the altitude and climatic conditions of the republic. The keen air, with its high electric tension and high percentage of ozone, the superabundance of light rays of short wave length and the mild to low temperatures form a combination of circumstances which cause most infectious diseases to lose in virulence. This phenomenon has been noted especially with regard to influenza, enteric fever, the exanthemata, tuberculosis and morbilli. Prophylaxis is discussed and mention is made of restriction and watching of immigration, education of the public with regard to the dangers of the disease, compulsory notification and compulsory treatment and coordinated effort on the part of public bodies in carrying on the campaign against the disease.

Plastic Dacryorhinostomy.

J. J. CORBETT (*American Journal of Ophthalmology*, October, 1928) considers that the method of Dupuy-Dutemps and Bourguet is the best operation for effecting direct anastomosis of the tear sac with the nasal mucous membrane. He holds that extirpation of the lachrymal sac is an obsolete procedure. The French surgeons operate with local injection of "Novocain," the nasal mucosa being anæsthetized by a swab of wool soaked in 10% cocaine solution placed in the middle meatus of the nose near the anterior tip of the middle turbinate. The operation is external throughout. The incision is that for extirpation of the sac beginning five millimetres above the internal palpebral ligament passing downwards five millimetres inside the canthus to a point over the entrance of the naso-lachrymal canal. The sac is exposed and reflected outwards as it is lifted out of its bony groove and held in this position by a retractor, another retractor drawing inwards the other side. The next step

is the complete removal of the anterior lachrymal crest by means of a chisel. When the nasal mucous membrane is exposed, the bony opening is enlarged by a Citelli forceps by means of an opening ten to twelve millimetres vertical measurement by eight to ten transverse measurement. At this stage the sac is opened by a longitudinal incision and cleaned out and swabbed with iodine. The nasal plug is then removed. A vertical incision is made in the nasal mucous membrane. Three sutures of 000 catgut are passed through the posterior lips of the nasal mucosa with a small semicircular Deschamps needle. These three sutures are held taut while a cut two millimetres long is made at a right angle to the upper and to the lower end of the vertical incision. The three sutures are now drawn through the posterior lip of the sac incision by a small Reverdin needle, tied and cut close. Three catgut sutures are then passed through the anterior lip of the nasal mucosa and held taut while the right angled cuts are made. These sutures are then drawn through the anterior border of the sac and through the periosteum and overlying soft tissues and tied. The skin is then sutured with silk. Good illumination with a hard light is essential. Up to September, 1922, one hundred and fifty operations were performed. Of 115 patients who returned for observation, complete cure was effected in 104. The author has achieved complete cure in twenty-eight out of thirty-one.

LARYNGOLOGY AND OTOLOGY.

Mastoid Surgery.

DOUGLAS GUTHRIE (*Journal of Laryngology and Otology*, October, 1928) discusses mastoid surgery in childhood. He bases his remarks on his experience in fifty consecutive mastoid operations performed in 1927. Of these thirty-two were for uncomplicated acute mastoiditis, ten were for uncomplicated chronic mastoiditis, four were for mastoiditis with intracranial complications, two were for aural tuberculosis and two for mastoid fistula. Mastoiditis is more common in the first year of life and during the spring season. For uncomplicated acute mastoiditis Schwartze's technique was employed. After all cells had been dealt with, the cavity was dried with rectified spirit, which was also blown through the aditus into the middle ear cavity. All bony surfaces were then rubbed with bismuth-iodoform-paraffin paste, the soft tissue margins undercut and the skin sutured. In four patients "fat grafting" was tried. In two healing by first intention resulted; in the other two inflammation necessitated removal of the graft. The author has returned to the bismuth paste and suture technique and claims healing by first intention as the rule with discharge from hospital ten days after operation. In only one patient did recurrence of the mastoid affection occur; this took place six months later. The treatment of chronic mastoiditis proves more difficult. In five patients adenectomy followed by thorough cleansing of the ear and drop treatment regularly resulted in cure. In others many methods had been tried in previous years. Ionization was used with discouraging results. The radical mastoid operation gave very unsatisfactory results. The modified operation gave good results, but necessitated a long term of in-patient treatment and often affected the hearing adversely. Simple operation and retention for some weeks of a drainage to the aditus proved unsuccessful. Finally in this series excision of the infected antrum and cells together with antiseptic medication of the naso-pharynx was found to give the best results. The technique followed consisted of first enlargement of tympanic membrane perforation, wide excision of the mastoid, including the antrum and other cells. The cavity is dried with rectified spirit, rubbed with bismuth-iodoform-paraffin paste and the wound completely closed by suture. For the naso-pharynx "Argyrol" in glycerine or "Gomenol" in olive oil was found to be effective. The wounds in all ten patients thus treated all healed by first intention. Six had dry ears but in four discharge continued. The author is of opinion that the radical operation should not be performed in patients under twelve years, save in the presence of cholesteatoma, intracranial complications or tuberculosis of the ear.

Tuberculosis of the Tonsils.

GORDON R. SCARFF AND L. E. H. WHITBY (*Journal of Laryngology and Otology*, May, 1928) report their findings in the study of the incidence of tuberculous infections of the tonsils in children. During recent years the tonsils have been regarded as the portals of entry of the *Bacillus tuberculosis* in cervical adenitis and at times in pulmonary tuberculosis. Mitchell found that 9% of chronically diseased tonsils contained either tuberculous tissues or harboured the *Bacillus tuberculosis*. His investigation was carried out during the war when food and housing conditions were abnormal. Weller found 2·35% of infected tonsils. In the authors' investigation material was used from children of two to twelve years of age and except in two none showed signs suggesting tuberculous adenitis. One hundred tonsils were submitted to histological examination and a further one hundred to histological examination and animal experiment. In the first hundred only two were found to contain tuberculous formations. In the second hundred two were found histologically and three by animal experiment to be tuberculous. Animal experiment was not entirely satisfactory. To avoid sepsis by injection of mixed organisms present in the tonsil Petroff's method of exterminating the other organisms was employed. The guinea-pigs in thirty-eight instances contracted a fatal intestinal epidemic while under observation. A definite opinion was formed of only sixty-two specimens. The findings are almost the same as those of Weller, whose series numbered 8,697 histological examinations after tonsillectomy in thirteen years. In explaining the difference from Mitchell's results the authors point out that the east coast of Scotland has the highest incidence of tuberculous cervical adenitis of any part of the British Isles. Further, the economic conditions at the time of Mitchell's investigations were bad and an investigation of 406 samples of milk in Edinburgh at that time showed that 20% contained tubercle bacilli. During the author's investigations it was determined that 5% of the London milk supply was contaminated with tubercle bacilli. The conclusions are that less tuberculous cervical adenitis is now encountered and that the diminution is due to purer milk supply and better education of the people in sterilization methods. Tonsillectomy is not a preventive of tuberculous adenitis, but it should be done in the presence of actual disease, when great benefit is obtained.

Frontal Sinus Operation.

HAROLD KISCH (*Journal of Laryngology and Otology*, June, 1928) describes his new operative technique for dealing with frontal sinus suppuration. He condemns the intranasal operation because it necessitates the use of a rasp which means a grave risk of osteomyelitis. The usual external frontal sinus operation is objected to owing to the poor cosmetic results, the long convalescence and the risk of injury to the pulley of the superior oblique muscle of the eye. The new operation overcomes these disabilities and allows of complete exenteration of the anterior ethmoidal cells which the author considers a necessity when dealing with frontal sinus sepsis. An incision two and a half centimetres long is made from the supraorbital notch downwards, forwards and medially round the inner canthus of the eye. The ascending process of the maxilla is exposed by medial retraction. A square block of this bone is removed by chiselling and the entrance to the frontal sinus is enlarged by the same means. The frontal sinus is inspected and, if conditions present necessitate a radical operation, it can easily be carried out by extension of the incision. The anterior ethmoidal cells are then dealt with. The wound is closed entirely by sutures and no drainage tube is used. Irrigation of the frontal sinus is carried out from the fourth day. There is no disfigurement and excellent results have been obtained.

British Medical Association News.

SCIENTIFIC.

A MEETING OF THE SOUTH AUSTRALIAN BRANCH OF THE BRITISH MEDICAL ASSOCIATION was held at the Darling Building, University of Adelaide, on September 20, 1928, DR. JOHN CORBIN, the President, in the chair.

Radium Treatment.

DR. ARTHUR BURROWS read a paper entitled: "Radium Treatment in Australia" (see page 131).

DR. JOHN CORBIN, the President, expressed his great appreciation of Dr. Burrows's paper and said that it had been of particular interest to him because, as far as he knew, radium treatment on such systematic lines had not been carried out in Adelaide. He wished to ask two questions. First, had radium been given an extensive trial in the treatment of exophthalmic goitre? If so, what was the effect and how was it used? Secondly, Dr. Burrows had stated that the generally accepted opinion was that the best method of treatment was by a moderate dose applied over a long period, from seven to fourteen days. He asked whether there was much risk of the needles working out of position, owing to necrosis of the surrounding tissues.

DR. C. T. CH. DE CRESPIGNY asked Dr. Burrows whether radium had been used in the treatment of the leuchæmias, either by application to the spleen or to the lymphatic glands.

DR. H. M. JAY stated that he frequently read of the use of radon seeds in the treatment of malignant disease of the pharynx and larynx. He felt that there was much confusion existing in regard to these terms and he wished to ask Dr. Burrows whether the radon seed was the same as the preparation which Dr. Burrows had called an emanation seed.

DR. LEONARD LINDON said that several articles had appeared recently in the British journals on the treatment of carcinoma of the tongue by radium and he had gathered from these articles that the radium had been planted in the normal tissues surrounding the growth and not actually into the growth itself. He asked Dr. Burrows whether in Regaud's technique the needles were inserted into the growth or into the adjacent normal tissues.

DR. RUPERT MAGAREY said that he had seen several patients with carcinoma of the *cervix uteri* who had developed vesico-vaginal fistulæ following treatment by radium. Dr. Burrows had spoken of Heyman's methods of using radium in this condition and he (Dr. Magarey) had been interested to note the duration of the treatment. He wished to know whether the risk of causing a vesico-vaginal fistula was greater after treatment by a low dose of long duration or after a big dose given for a short period.

DR. H. C. NOTT raised the question of the treatment of extensive rodent ulcers which had penetrated into bone and cartilage, such as were seen to occur on the face and skull. He asked Dr. Burrows whether radium treatment gave better results than surgical methods and also, if using radium, how did Dr. Burrows deal with exposed bone.

DR. A. A. LENDON proposed a vote of thanks to Dr. Burrows for having given to the Branch a paper dealing so lucidly with a subject which was of particular interest to all, in view of the fact that the Commonwealth Government health authorities would shortly make available a considerable quantity of radium for the treatment of malignant disease in South Australia. He hoped that Dr. Burrows's paper would also stimulate the interest of members in the public meeting to be held in Adelaide on October 4, at which the chief speaker would be Sir Neville Howse. He wished to thank Dr. Burrows very heartily.

SIR HENRY NEWLAND said that he had great pleasure in seconding the proposal of Dr. Lendon. From the facts and figures given by Dr. Burrows it was obvious that in carcinoma of certain regions of the body the ordinary methods of surgical treatment must give place to the use of radium. But he wished to lay emphasis on the statement of Dr. Burrows that radium must be used along the lines of a scientifically prepared technique and not in any haphazard method. It would still be necessary to learn the surgery of access and radium treatment would still demand a knowledge of anatomy and pathology in surgeons, if it was to be attended by success.

DR. BURROWS thanked the members for the reception they had given to his paper. In reply to Dr. John Corbin he said that he had seen the results in a large number of patients with exophthalmic goitre treated by radium at Manchester. He thought the position was as follows. The results were neither as rapid nor as striking as after surgery, but were frequently as good in the long run. Radium treatment certainly avoided the immediate operative risk. It was very necessary to remove all sources of infection. In the Manchester series there were 20% of complete cures, but many patients remained with myocardial degeneration. All the patients were treated by surface application.

In spleno-medullary leuchæmia a good temporary result was obtained, but each subsequent treatment was less successful. In lymphatic leuchæmia the effect upon the glands was immediate, but it was remarkable that there was no change in the blood picture.

The term radon seed was coined by the manufacturers. The active substance within them was radium emanation and they were just the same as emanation seeds.

In reply to Dr. Lindon, he said that Regaud and all the prominent radium workers inserted the needles into the growth itself. The method of insertion into the adjacent healthy tissue was based on a wrong conception of the physics of radium. Mr. Sampson Handley and others had inserted the needles into the surrounding tissues on the theory that by doing so the maximum effect would be on the actively spreading margin of the growth. They overlooked the fact that by inserting the needles around the growth they obtained a summation of dose in the centre of the tumour.

With regard to vesico-vaginal fistulæ he believed that there was less risk after the use of a small dose over a long period. It was not advisable to insert the needles in the antero-posterior line, but rather to insert one needle on either side of the anterior and posterior fornices. But it had to be remembered that if the growth already involved the bladder wall, any technique which destroyed the growth must be accompanied by the risk of a fistula and these were obviously the least hopeful cases. With regard to rodent ulcers penetrating bone and cartilage he thought that the best treatment was by a thorough use of diathermy right down to the bone. If radium were used, he advised the distance technique for a long period, the radium being used at a distance of from one to two centimetres for a week.

A MEETING OF THE VICTORIAN BRANCH OF THE BRITISH MEDICAL ASSOCIATION was held at the Medical Society Hall, East Melbourne, on October 16, 1928, DR. J. NEWMAN MORRIS, the President, in the chair.

Radium Treatment.

DR. ARTHUR BURROWS read a paper entitled "Radium Treatment in Australia" (see page 131).

DR. R. H. THWAITES, who was absent through illness, sent a communication which was read by DR. W. W. S. JOHNSTON. Dr. Thwaites thanked Dr. Burrows for his most interesting paper giving an outline of the views, principles and methods in accordance with which it was proposed to employ the very liberal supply of radium which the Commonwealth Government had recently obtained. He

thought that the Commonwealth Government was to be congratulated upon the possession of such a large amount of radium and Dr. Burrows upon the almost unique opportunities which he would have in trying and developing methods and techniques.

He noted with particular interest and satisfaction that the greater proportion of the total amount of this radium had been so put up as to indicate that in a general way the technique and methods of Regaud were to be followed. When abroad in 1923 and 1924 investigating modern radio-therapeutical measures, he had found that the consensus of opinion in America, Canada and Europe was strongly in favour of Regaud and indeed the new and improved status of radium therapy had been ascribed almost wholly to him. After directly investigating these methods and the results obtained under Regaud at the Paris institute, Dr. Thwaites had decided upon adopting them and he had been working along these lines in both public hospital and private practice ever since and while neither the time for which he had been at work nor the number of cases which he had done, was yet sufficiently extensive to enable him to set out results statistically, he could definitely state that some very striking ones had been obtained. He believed that Dr. Burrows was to be congratulated upon having been one of the first to recognize the importance of the experimental and clinical work carried out by Regaud and the potential advantages of his methods and to apply and develope them in his own practical clinical work.

As regards the mass treatment apparatus, he believed that such had been used more extensively in Paris and at the Memorial Hospital, New York, than anywhere else. In both places this method was considered to possess a definite advantage over all others in certain cases. At first glance it would seem that short wave Röntgen rays from a modern high-powered X ray plant should be equally effective and much more economic. But possibly the more selective action of the very short γ rays from radium (which were much shorter than any X rays which were as yet clinically available) might prove to confer a special value upon the mass radium treatment method.

Dr. Burrows's brief summary of the successive stages of local reaction following an effective radium treatment should be valuable to practitioners not familiar with them. Should the information he had given under this heading, induce the abandonment of poulticing, fomenting and the other unnecessary and improper methods of seeking to relieve such reactions, as well as the tendency to condole with the patient upon the radium "burn" which had been inflicted, much good would result.

Dr. Thwaites found himself in general agreement with the views regarding methods of radium application expressed by Dr. Burrows and, like him, he felt that they must further develope their methods of surgical access. He had treated a few patients with glandular carcinomatous metastases by burial of radium needles within and around the glands after these had been exposed to some degree by surgical methods. The results had been most encouraging. Also, in conjunction with Mr. Maclure, he had buried a number of needles in a carcinoma of the posterior rectal wall after obtaining access by the removal of the coccyx and tip of the sacrum in the manner advocated by Gordon-Watson. He thought there was definite scope for advance along these and similar lines of securing more efficient placement of the radium units by surgical procedures. In fact, he had been inclined to regard some of his failures not as the failures of radium, but as the failures of the technique of applying it.

In the treatment of carcinoma of the *cervix uteri*, he had developed a technique which was rather a combination of those of Malcolm Donaldson and Regaud in that he both inserted tubes into the cervical canal and buried needles in the cervical growth and tissues so as completely to surround and penetrate it. He had previously followed Donaldson in inserting some of his longer needles into the broad ligaments, but he had replaced these latter by applications of "deep therapy" to the parametrium and deep iliac glands and he thought the results obtained by this combined procedure were rather better.

As regards radium emanation, he thought that this particular form of radium apparatus was rightly losing ground and its special value was becoming more and more limited. The disadvantages of the unscreened glass seeds outweighed their advantages, while screening them with gold, platinum *et cetera* converted them into units practically identical with the standard radium needles, except for their very short life, the large amount of preparatory work they entailed, and the lack of uniformity of their ray output.

DR. C. DENNIS congratulated Dr. Burrows on his excellent and lucid lecture. Dr. Dennis described the practice in radiotherapy at the Women's Hospital, Carlton, during the previous few years. The Hospital possessed no needles and no emanation, but used twenty-five milligrammes of radium bromide in four silver tubes of one-half millimetre thickness enclosed in brass of one millimetre thickness covered again with aluminium and rubber. Nearly all the patients had been frankly inoperable and treatment had been palliative only in most instances, without any hope of cure. One tube was placed in the cervix and the others packed round the cervix in the vault of the vagina. The time of exposure had been twenty hours and more recently forty hours with all four tubes in the vault of the vagina and none in the cervical canal. Statistics obtained had not been sufficiently reliable for any conclusions to be based on the results of this method of treatment. In his private practice Dr. Dennis had used a similar technique supplemented by deep X ray therapy filtered through copper. Deep X ray therapy was now in use at the Women's Hospital, but had not been used sufficiently long to permit a discussion of results.

Dr. Dennis had had considerable experience of the radium therapy of superficial skin lesions and had been much impressed with its value. He considered that it was important to warn the patients of the local reaction which was to be expected after the application of radium.

DR. H. FLECKER asked whether the Commonwealth supply of radium was to be available for metropolitan and country hospitals and private practitioners. He also quoted cases in his own practice in which deep X ray treatment of rodent ulcers of the nose and eyelids involving cartilage had cleared up and remained cured up to the present, involving periods of three, four and five years since treatment.

DR. H. DOUGLAS STEPHENS said that about two children suffering from renal sarcomata were admitted to the Children's Hospital every three years. When these tumours were removed by operation, the child usually returned within eight to twelve months with secondary growths in the peritoneal glands. Deep X ray therapy had prolonged the time of appearance of these multiple sarcomata to two and in one case to three years. Dr. Stephens asked whether radium might be used with advantage in such cases.

DR. C. G. CROWLEY expressed doubt as to the efficacy of radium therapy in the treatment of rodent ulcers involving cartilage.

DR. H. R. DEW joined in the general appreciation of the paper and said that his own interest lay particularly in the treatment of malignant growths of the tongue, mouth and tonsil, in which the results of surgical treatment were so often tragic. These results had been improved by diathermic coagulation, but it seemed that radium promised to replace surgery in the treatment of oral malignant disease with the exception of diathermy applied to the floor of the mouth.

Radium in such conditions picked out the pathological tissue and spared the normal tissue, a result usually impossible with surgery. The difficulty was to obtain a complete radiation of the whole of the malignant tissue. Dr. Dew thought that the treatment of secondary malignant deposits in glands, especially those in the neck, was likely to remain a surgical problem.

DR. E. A. SPOWERS asked if Dr. Burrows had experienced any of the catastrophies of radium treatment of the uterine cervix in the way of cicatrization of the bladder or rectum or the formation of fistulæ.

DR. K. G. COLQUHOUN emphasized the value of radium therapy in the superficial keratoses of the skin. He considered that there was no hope of obtaining good results in treating the larger skin epitheliomata without burying radium needles in the tumour.

DR. J. NEWMAN MORRIS said that the paper and the discussion had been of great value to the profession in Melbourne. Not long before he had removed an epithelioma of the skin after it had been subjected to unsuccessful radium therapy for two years and nine months and had removed a rodent ulcer of the nose by diathermy after four and a half years of radium therapy. Dr. Morris had seen a third patient with an enormous fungating epithelioma of the face involving the nose, mouth and one eye. This growth had defied years of treatment with radium combined with surgical treatment.

Dr. Morris said that the time had arrived when the true position regarding radium therapy should be stated, statistics collected and results classified.

DR. BURROWS in reply to the comments of Dr. Thwaites said that the results of burying needles in secondary malignant glands had been good in some cases, but bad in others. Professor Regaud's method was probably preferable. Speaking of carcinoma of the rectum, Dr. Burrows said that if the growth were not annular and occupied only one side of the bowel, if accessible, it could be treated satisfactorily sometimes by burying needles in the substance of the growth. The Belgian method of removing portion of the sacrum and burying needles in the growth by that route was responsible, it was claimed, for 40% of cures. Radium emanation was by no means superseded, as it was still the quickest method of applying new ideas in radium therapy.

In reply to Dr. Dennis, Dr. Burrows said that Regaud's technique could be tried at the Women's Hospital, if it was desired, with the amount of radium available there. Regarding the treatment with deep X rays combined with radium, Professor Regaud had suggested that the dosage of both types of energy should be measured in ergs. Such a system, if generally adopted, would make it easier to measure and control dosage.

In reply to Dr. Flecker, Dr. Burrows said that it was proposed to establish one big radium centre in each capital city, as it was considered preferable for a patient to travel to the larger centre rather than face the possibility of less efficient treatment in a smaller one.

Referring to the cases in infantile sarcomata quoted by Dr. Stephens, Dr. Burrows said that the general experience of such cases was very limited. He had seen no permanent good results by burying emanation tubes in the growths or in the operation sites, but there had been some permanent good results by operation combined with deep X ray therapy.

In respect to Dr. Crowley's remarks Dr. Burrows agreed that when rodent ulcers attacked bone or cartilage, the percentage of cures was less than in other cases.

Dr. Burrows agreed with Dr. Dew that radium would probably replace diathermy in the treatment of malignant growths of the tongue, but thought that in secondary growths excision followed by radium treatment would probably give the best results. In the treatment of carcinoma of the mouth and tongue it was essential to know beforehand exactly what it was intended to do and if necessary to make diagrams of the area occupied by the tumour, so that the whole of the malignant tissue could be brought under the influence of an adequate dose of γ radiation. Care in planning and precision of technique were both necessary to good results.

Carcinoma of the larynx had been successfully irradiated through a window cut in the thyreoid cartilage.

In reply to Dr. Spowers, he said that catastrophies in radium treatment in the female pelvis usually occurred in the attempt to treat patients in whom disease was too far advanced, or they were caused by the use of too caustic rays. It was important never to insert a needle in a growth in the mid-line between the bladder and cervix if the area was infiltrated with growth, as this was likely to produce a fistula. It was advisable to be careful in burying needles between the cervix and the rectum. The blood vessels supplying the uterus and cervix must be avoided in burying needles laterally.

Referring to Dr. Colquhoun's remarks, Dr. Burrows said that in treating skin cancer there was no need to bury needles unless the growth was more than fifteen millimetres thick. In other cases surface treatment at a distance was effective.

In the effort to obtain more useful statistics it was proposed to adopt a uniform system of case taking and records throughout Australia.

NOMINATIONS AND ELECTIONS.

THE undermentioned have been nominated for election as members of the New South Wales Branch of the British Medical Association:

O'Brien, John, M.B., B.S., 1927 (Univ. Sydney), Acacia, The Broadway, South Strathfield.

Goodwin, Cecil Benjamin, L.R.C.P. (Edinburgh), L.R.C.S. (Edinburgh), L.R.F.P.S. (Glasgow), 1928, 90, Milton Street, Ashfield.

Telfer, Archibald Craig, M.B., B.S., 1927 (Univ. Sydney), 141, Moruben Road, Mosman.

Williams, Henry Bruce, M.B., Ch.M., 1924 (Univ. Sydney), Royal Hospital for Women, Paddington.

Wing, Marie Naomi, M.B., B.S., 1927 (Univ. Sydney), Pambula.

THE undermentioned have been elected members of the New South Wales Branch of the British Medical Association:

Baxter, Ernest Joel, M.B., Ch.M., 1925 (Univ. Sydney), Tranmere Street, Drummoyne.

Collins, Kevin James, M.B., Ch.M., 1926 (Univ. Sydney), Glenrock Lodge, Edgecliff.

Gleeson, William Sydney, M.B., Ch.M., 1926 (Univ. Sydney), Royal Alexandra Hospital for Children, Camperdown.

Goodwin, Cecil Benjamin, L.R.C.P. (Edinburgh), L.R.C.S. (Edinburgh), L.R.F.P.S. (Glasgow), 1928, 90, Milton Street, Ashfield.

Sender, Isidor Harry, M.B., B.S., 1928 (Univ. Sydney), Kambala Road, Bellevue Hill.

O'Brien, John, M.B., B.S., 1927 (Univ. Sydney), The Broadway, South Strathfield.

Telfer, Archibald Craig, M.B., B.S., 1927 (Univ. Sydney), 141, Moruben Road, Mosman.

Williams, Henry Bruce, M.B., Ch.M., 1924 (Univ. Sydney), Royal Hospital for Women, Paddington.

Wing, Marie Naomi, M.B., B.S., 1927 (Univ. Sydney), Pambula.

MEMORIAL TO THE LATE HARRY JOHN CLAYTON.

IN our issue of December 15, 1928, an announcement was made that the friends of the late Harry John Clayton resolved to collect subscriptions for the purpose of establishing a prize to perpetuate his name at the University of Sydney. The following is the first list:

	£	s.	d.
H. J. R. Clayton	50	0	0
Dr. J. McKelvey	15	15	0
Dr. B. P. Anderson Stuart	10	10	0

	£	s.	d.
Dr. Collins, Dr. Fitzgerald and Dr. Utz	10	10	0
G. A. Gluck	10	10	0
Miss M. J. Jones	10	10	0
A. R. Buckland	10	0	0
J. A. Buckland	10	0	0
Dr. C. B. Blackburn	5	5	0
Dr. Sinclair Gillies	5	5	0
Dr. R. S. Godsall	5	5	0
Dr. E. M. Fisher and Mrs. Fisher	5	5	0
V. Machen	5	5	0
T. V. Nicholls	5	5	0
J. L. Hudson and Mrs. Hudson	5	0	6
Miss E. M. Nelson	5	0	0
Miss Reinhard	5	0	0
Dr. H. J. Daly	3	3	0
Miss A. B. Hunt	3	3	0
Dr. H. R. G. Poate	3	3	0
Dr. E. Susman	3	3	0
Dr. S. H. Weedon	3	3	0
Mrs. S. Fraser-Fitzhill	2	2	6
Dr. A. W. Murray	2	2	6
Miss E. Blomfield	2	2	0
Dr. A. O. Davy	2	2	0
W. Delaney	2	2	0
Dr. O. A. Diethelm	2	2	0
Dr. B. T. Edye	2	2	0
H. V. Jaques	2	2	0
Dr. E. M. Little	2	2	0
Dr. C. G. McDonald	2	2	0
C. Pain	2	2	0
S. G. Rowe	2	2	0
N. Storaker	2	2	0
Dr. A. H. Tebbutt	2	2	0
Dr. A. J. Traill	2	2	0
A. H. Way	2	2	0
Dr. P. Kelly	1	1	9
Dr. S. G. Iceton	1	1	6
Dr. W. F. L. Liggins	1	1	6
Dr. C. Molesworth	1	1	6
Dr. S. V. O'Regan	1	1	6
Dr. H. S. Walsh	1	1	6
Dr. R. F. Back	1	1	0
Dr. J. C. Blair	1	1	0
Sister Cantwell	1	1	0
Dr. Gordon Craig	1	1	0
Dr. W. B. Dight	1	1	0
Dr. W. H. Donald	1	1	0
Dr. N. E. Fenner	1	1	0
Dr. R. W. Francis	1	1	0
Dr. L. B. Heath	1	1	0
Dr. A. J. Gibson	1	1	0
Mrs. Gibson	1	1	0
Dr. H. S. Kirkland	1	1	0
Dr. D. B. Loudon	1	1	0
Captain F. Lubrano	1	1	0
J. A. McLeod	1	1	0
Miss N. McShane	1	1	0
Dr. N. J. Nye	1	1	0
Dr. G. A. Pockley	1	1	0
Dr. Cecil Purser	1	1	0
Miss N. Robinson	1	1	0
K. L. Sayers	1	1	0
W. A. Selle	1	1	0
Dr. L. J. Shortland	1	1	0
B. V. Stacy	1	1	0
Dr. M. Thomas	1	1	0
Dr. R. H. Todd	1	1	0
Dr. A. S. Waterhouse	1	1	0
C. Waite	1	1	0
Dr. N. F. Benjamin	0	10	6
Dr. E. P. Holland	0	10	6
Miss F. E. Webb	0	10	6
Sister Webb	0	10	6
Miss E. Menzies-Smith	0	10	0
Matron Spahl	0	5	0
Total to date	£272	7	9

Correspondence.

A WARNING.

SIR: It would be for the benefit of the medical profession and private hospitals in Australia if you will publish this warning against an impostor who at present is probably in New South Wales. I am acquainted with at least two of his exploits in widely separated towns in this State. On both occasions he gave the name of James Blair, though I am told his real name is Froggatt. In appearance he is of average height, slim build and well dressed. His face is clean shaven, dark in complexion, thin and rather good looking. The ears are comparatively large. He is widely read, well educated and his manner is really charming. He tells many plausible stories inferring the wealthy circumstances of himself and his family. In each instance he has secured several weeks' attention, with board and lodging of course, in private hospitals. In neither has he paid the doctors or private hospitals. On the contrary, in one case he "borrowed" many articles from a soft-hearted nurse and pawned them. He was sentenced early this year to six months' imprisonment on a charge of obtaining money by means of a valueless cheque, but is now at large. His complaint on each occasion has been "renal colic" and I was able to find blood in the urine. Since, however, in the light of subsequent events, I have entertained doubts as to the genuineness of this discovery. It would be easy for him to prick his finger and let a few drops of blood mix with the urine. He evades any suggestion of X ray examination or operation. It is now seven or eight weeks since he left the scene of his last known imposture and it is not improbable that he is even now deceiving some country medical practitioner, enchanting the matron of the local private hospital and enjoying "hospitality" that will be but ill repaid. As he has been on the southern and western lines, he may next venture to the north or north coast.

Yours, etc.,

MERRICK O'REILLY.

Moss Vale.
December 27, 1928.

IMMUNITY TO DIPHTHERIA IN MAORIS.

A CORRESPONDENT recently referred to a statement published in a popular magazine to the effect that diphtheria had not been observed in a member of the Maori race. He inquired whether there was evidence in support of the statement and if so, whether there was any known explanation. We are indebted to Dr. T. H. A. Valentine, Director-General of Health for the Dominion of New Zealand, for the following information. Dr. Valentine states that the disease must be very rare among the Maoris, as he cannot remember a single instance of a Maori suffering from diphtheria.

The Medical Officer of Health of Auckland reports that seventeen notifications of diphtheria affecting Maoris have been received over a period of eleven years. While it is not known whether any of these infections were proved to be diphtheria by bacteriological means, it is assumed that the few patients who were admitted to the Auckland Hospital, would have been subjected to bacteriological examination. The Medical Officer of Health has reason to believe that all diphtheria infections are not notified to the Health Department. While he is of opinion that the Maori is not entirely immune to diphtheria, he is prepared to accept the suggestion that there is a considerable degree of racial immunity.

The Medical Officer of Health of Gisborne reports that no attack of diphtheria in a Maori has been proved bacteriologically in his district. He has found the throats of Maori children much healthier than the throats of white children examined in the same schools. He expresses the opinion that a racial immunity exists.

The Medical Officer of Health of Wellington reports that he has not seen a Maori of pure blood suffering from diphtheria, that is from an infection proved to be caused by the Klebs-Löffler bacillus. During the last nine years

the only Maori patients admitted to the Napier General Hospital on account of diphtheria were persons with European blood. He is of opinion that the Maoris possess a definite racial immunity.

The Medical Officer of Health of Christchurch reports that in his district there are few full blooded Maoris. Some Maoris are said to have had diphtheria and to have died from the disease, but no bacteriological investigation was carried out. He holds the opinion that some diphtheria infections are not brought to the notice of the Department of Health.

The Medical Officer of Health of Dunedin has made inquiries from the Medical Superintendent of the Dunedin Hospital and also from Professor Hercus, of the Otago University, and learns that there is no record of any illness in a Maori caused by the diphtheria bacillus. The Medical Officer of Health was for several years medical officer to the Maoris at the Tuahiwi Pah, in the neighbourhood of Christchurch, and he cannot remember having seen a Maori suffering from diphtheria. He is of opinion that there is a definite immunity to the disease, but he is doubtful whether it should be regarded as a racial immunity.

There is further evidence of the rarity of the disease among pure blooded Maoris. On the other hand it must be recognized that the conditions under which the Maoris live, are unfavourable to the epidemic spread of a disease like diphtheria. We invite members of the medical profession, especially those residing and practising in New Zealand, to communicate any information they may have on the subject to this journal. It would be of considerable interest if information could be recorded of outbreaks of diphtheria in any community of children which included some Maoris of pure blood. Unfortunately clinical diagnoses without bacteriological confirmation are of little use in dealing with this problem. The determination of a definite racial immunity, as opposed to an individual immunity or a high resistance to infections caused by a general good standard of health, cannot be reached unless the immunity reactions of the persons concerned are investigated.

Obituary.

NORMAN JOHN DUNLOP.

IT is with great regret that we have to announce the death of Dr. Norman John Dunlop which took place at his residence in New South Head Road, Sydney, on January 23, 1929.

Diary for the Month.

FEB. 6.—Victorian Branch, B.M.A.: Branch.
FEB. 6.—Western Australian Branch, B.M.A.: Council.
FEB. 7.—South Australian Branch, B.M.A.: Council.
FEB. 8.—Queensland Branch, B.M.A.: Council.
FEB. 12.—New South Wales Branch, B.M.A.: Ethics Committee.
FEB. 14.—Victorian Branch, B.M.A.: Council.
FEB. 14.—New South Wales Branch, B.M.A.: Meeting of the

Medical Appointments Vacant, etc.

For announcements of medical appointments vacant, assistants, *locum tenentes* sought, etc., see "Advertiser," page xvi.

DAYLESFORD DISTRICT HOSPITAL: Resident Medical Officer.
ECHUCA DISTRICT HOSPITAL: Resident Medical Officer.
ST. GEORGE DISTRICT HOSPITAL, NEW SOUTH WALES: Senior Resident Medical Officer.
THE ADELAIDE CHILDREN'S HOSPITAL. (INCORPORATED): Resident Medical Officers (Three).
WELLINGTON HOSPITAL BOARD, WELLINGTON, NEW ZEALAND: Orthopædic Specialist.

Medical Appointments: Important Notice.

MEDICAL practitioners are requested not to apply for any appointment referred to in the following table, without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCH.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 30 - 34, Elizabeth Street, Sydney.	Australian Natives' Association. Ashfield and District Friendly Societies' Dispensary. Balmain United Friendly Societies' Dispensary. Friendly Society Lodges at Casino. Leichhardt and Petersham Dispensary. Manchester United Oddfellows' Medical Institute, Elizabeth Street, Sydney. Marrickville United Friendly Societies' Dispensary. North Sydney United Friendly Societies. People's Prudential Benefit Society. Phœnix Mutual Provident Society.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries. Australian Prudential Association Proprietary, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
QUEENSLAND: Honorary Secretary, B.M.A. Building, Adelaide Street, Brisbane.	Members accepting appointments as medical officers of country hospitals in Queensland are advised to submit a copy of their agreement to the Council before signing. Brisbane United Friendly Society Institute. Stannary Hills Hospital.
SOUTH AUSTRALIAN: Secretary, 207, North Terrace, Adelaide.	All Contract Practice Appointments in South Australia. Booleroo Centre Medical Club.
WESTERN AUSTRALIAN: Honorary Secretary, 65, Saint George's Terrace, Perth.	All Contract Practice Appointments in Western Australia.
NEW ZEALAND (WELLINGTON DIVISION): Honorary Secretary, Wellington.	Friendly Society Lodges, Wellington, New Zealand.

Medical practitioners are requested not to apply for appointments to position at the Hobart General Hospital, Tasmania, without first having communicated with the Editor of THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

All communications should be addressed to "The Editor," THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, Sydney. (Telephones: MW 2651-2.)

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